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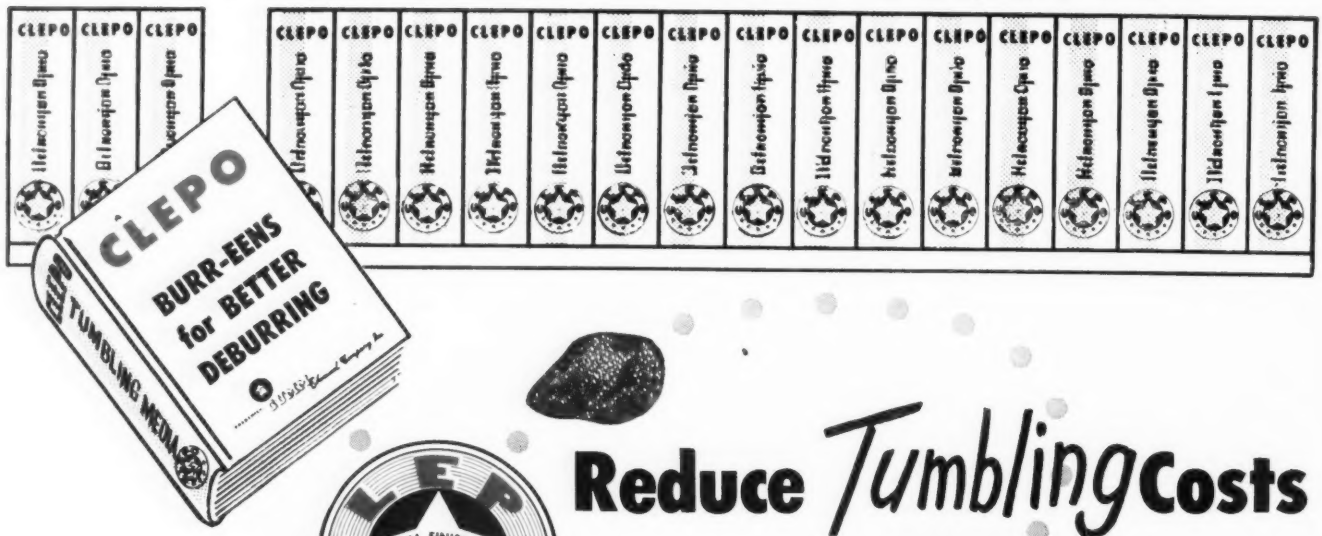

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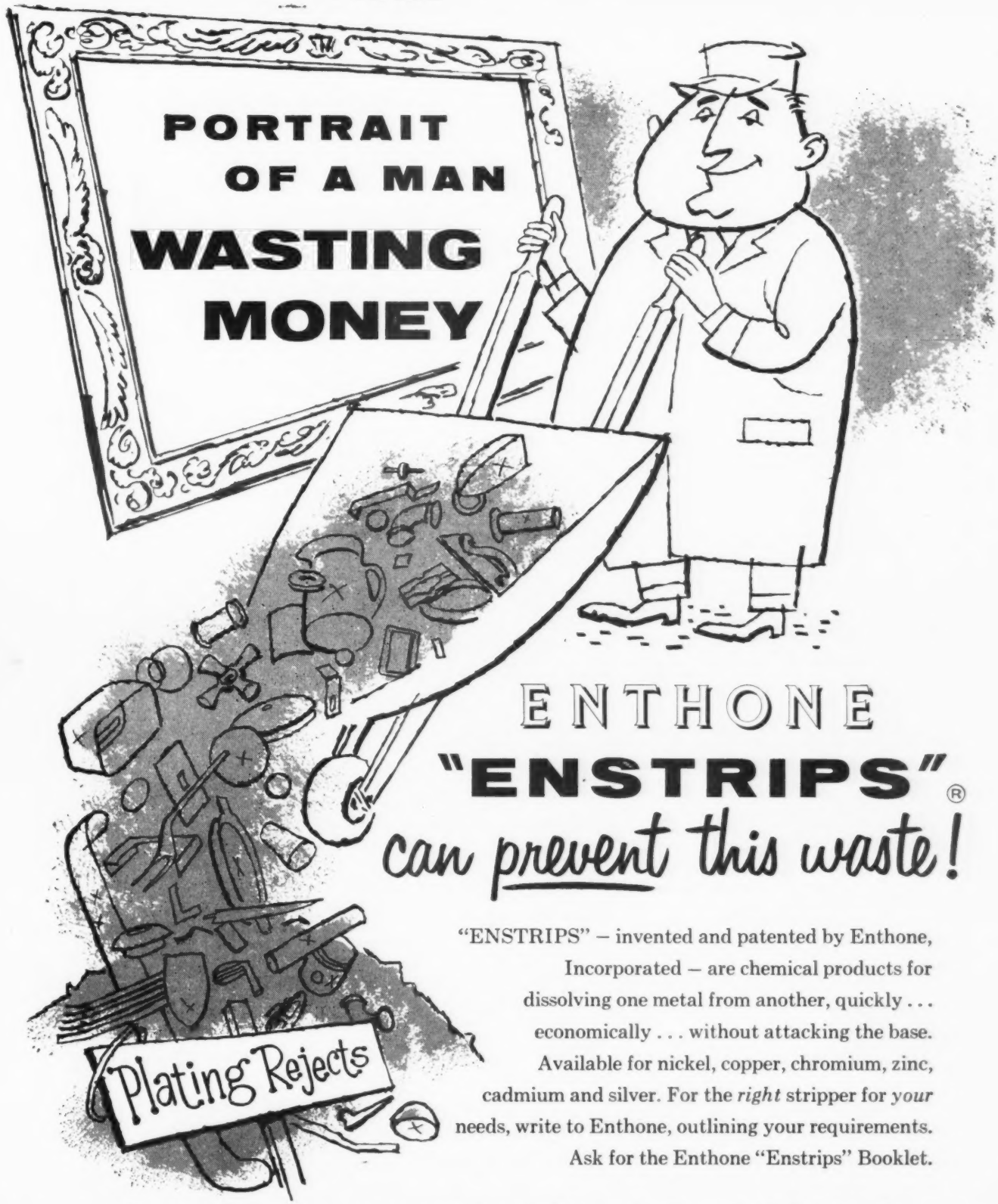

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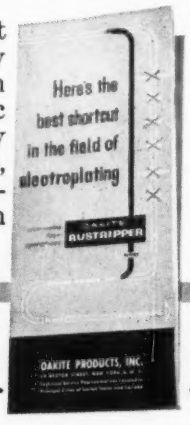

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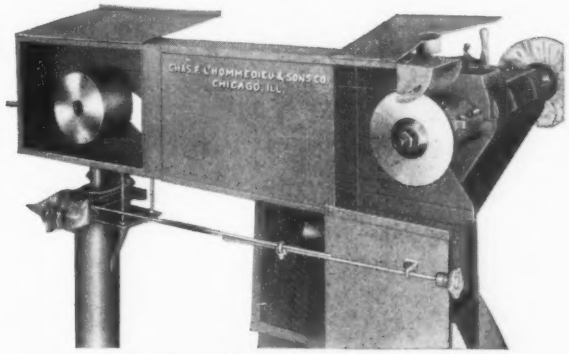
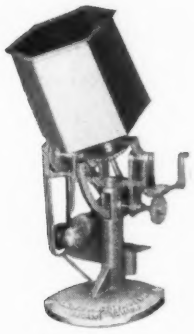
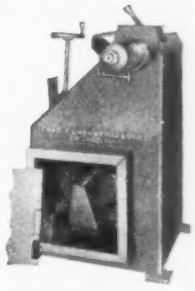


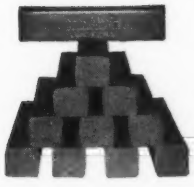
BACKSTAND IDLER WITH LATHE



OBLIQUE
TUMBLING BARREL



#23A
POLISHING LATHE



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A Timely Message on

Conserving An Unnatural Resource: Executive "Brain Power"

There has been considerable discussion recently about the shortage of manpower and skills: engineers, salesmen and trained labor.

I think some constructive concern with the shortage of top-level executive and management personnel is long overdue.

Now, I consider competent executive ability an *unnatural resource*. It is "unnatural" in that it has to be learned, the hard way, over many years. Granted, some natural traits of personality and attitude can incline a man toward successful business administration. But that's just a good, running start. Things may have seemed tough before. But now, with that final step up—frequently it's more like a flying leap!—the new executive find things unbelievably tougher.

Can he take it? Can he stand up physically to the new job? Who knows? Frequently, we can't tell until it's too late.

The basic solution, I'm convinced, is to prolong executive "brain power" by re-distributing the load. Most important, that load—especially everything that can be classified as "administrative detail"—should be delegated earlier, much earlier, to the junior group. And the junior executive, in turn, should gradually shift detail to his own promising young men.

Of course, the younger man cannot be overloaded. We only want to bend the twig . . . not break it! Nevertheless, if we are to conserve our nation's executive "brain power" for top-level planning and direction, we must delegate responsibility downward, earlier and on a broader basis. That way, we conserve at every state of development.

Most important, we prolong the mature executive's work by many valuable years.

Sincerely,

Ben P. Sax

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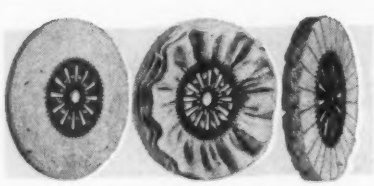

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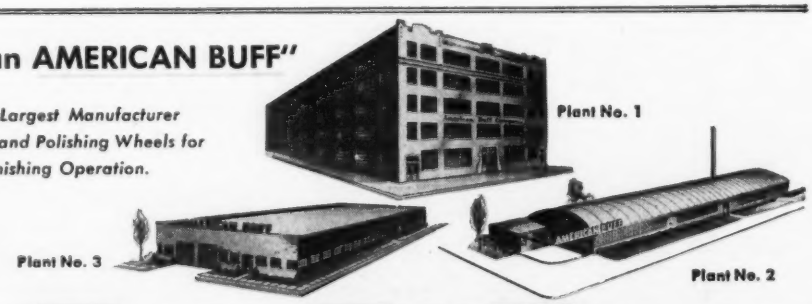

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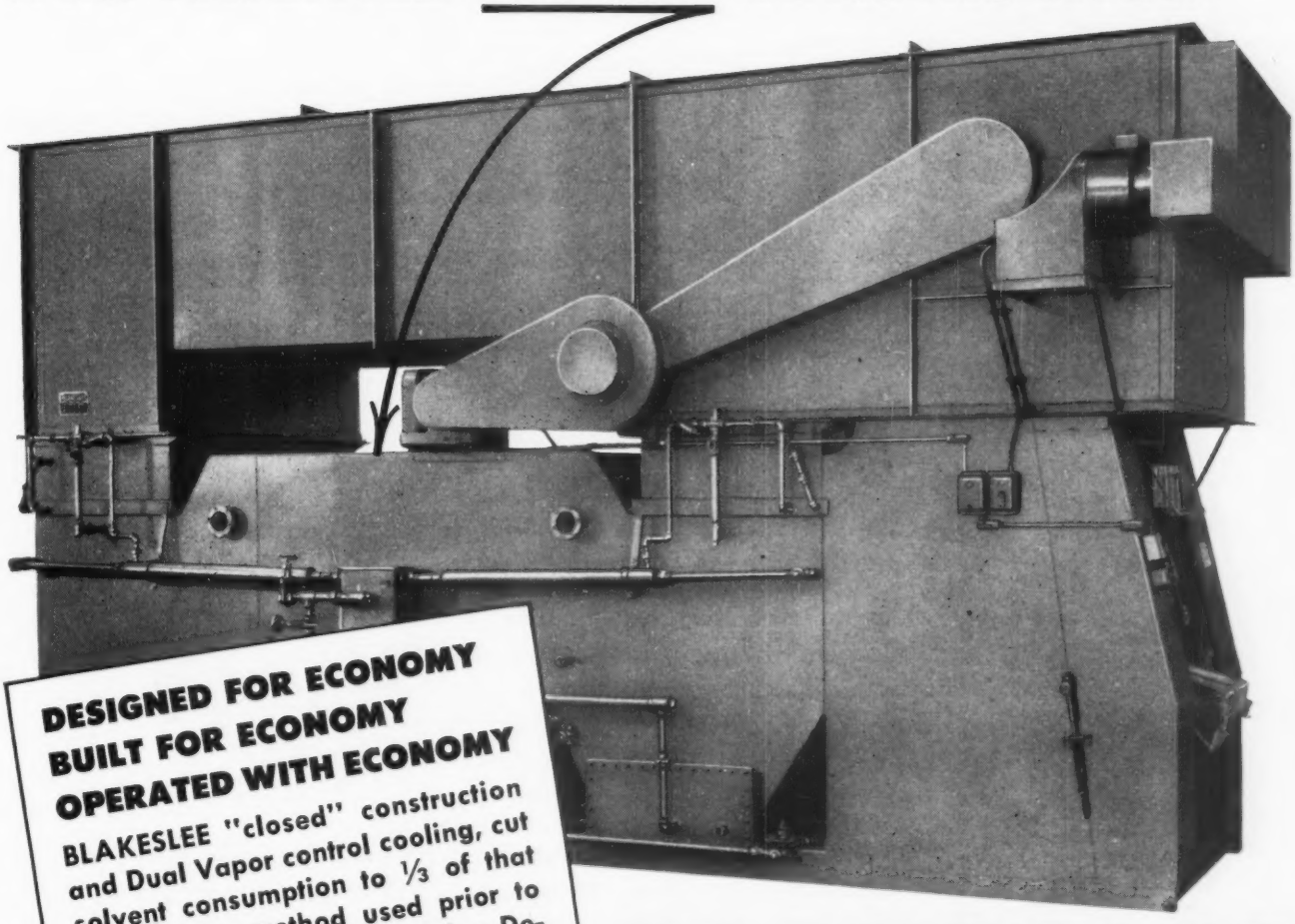

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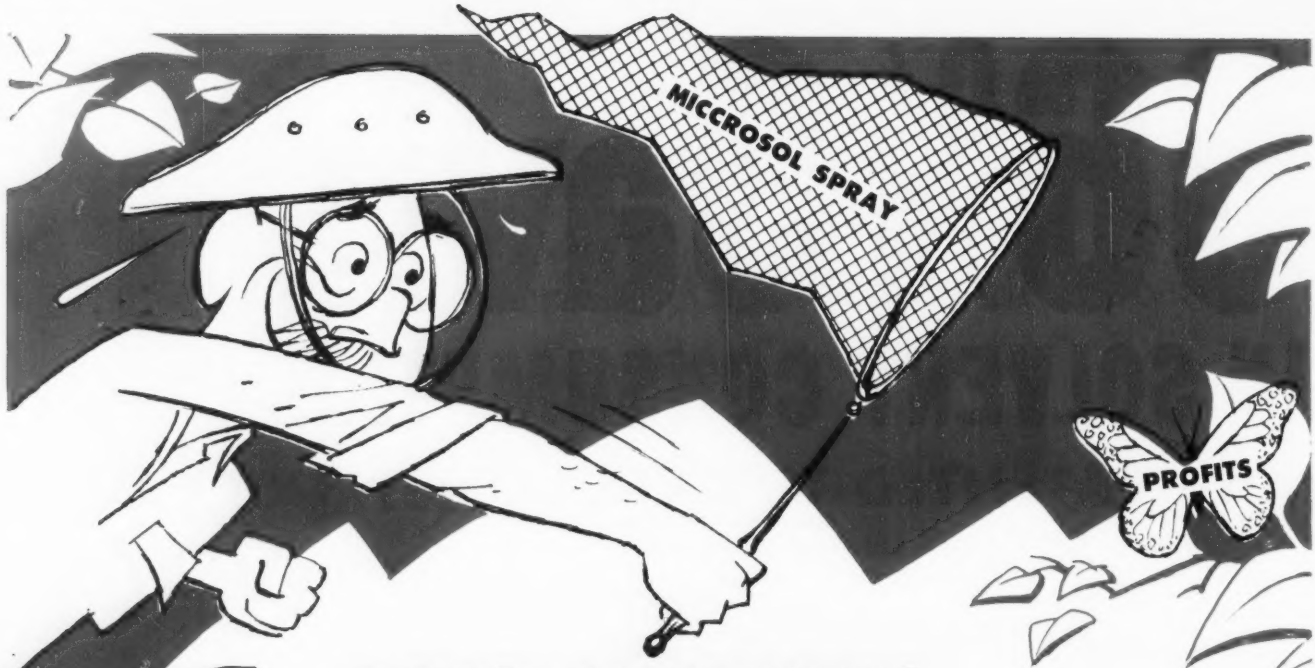

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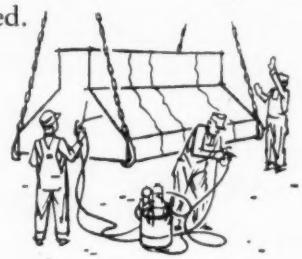

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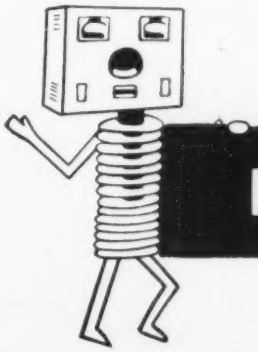

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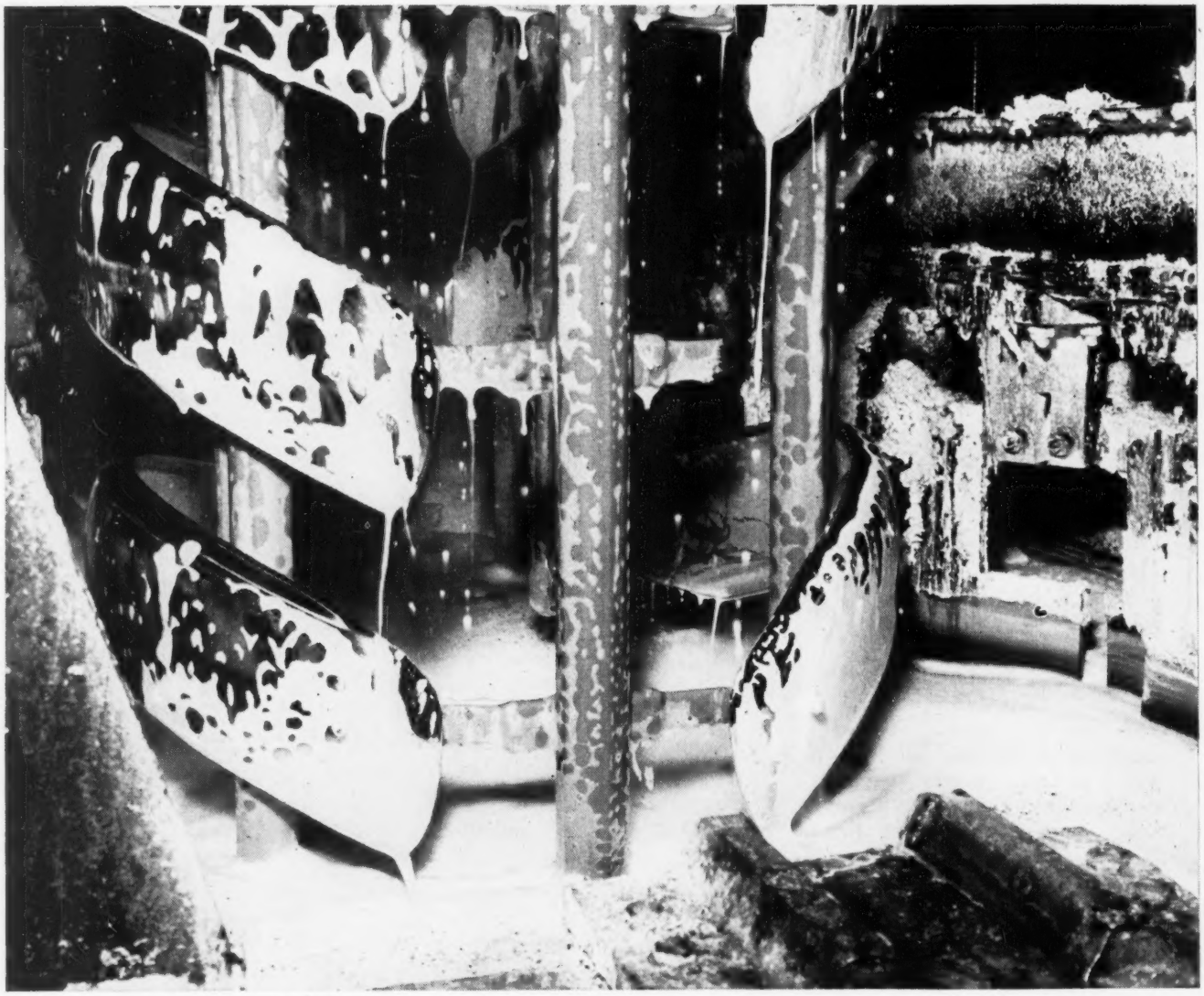

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5. **STRONGEST—MOST RUGGED MACHINE**
   Lift accomplished by powerful bridge-type super structure
6. **REQUIRES LEAST FLOOR SPACE**
   Smallest center island—shortest length
7. **MOST FLEXIBLE MACHINE**
   Rack spacing variable to suit processing requirements
8. **SMOOTHEST OPERATING**
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10. **MINIMUM INSTALLATION TIME AND COST**
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11. **FINEST REPUTATION AND ACCEPTANCE**
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12. **UNMATCHED SERVICE POLICY**
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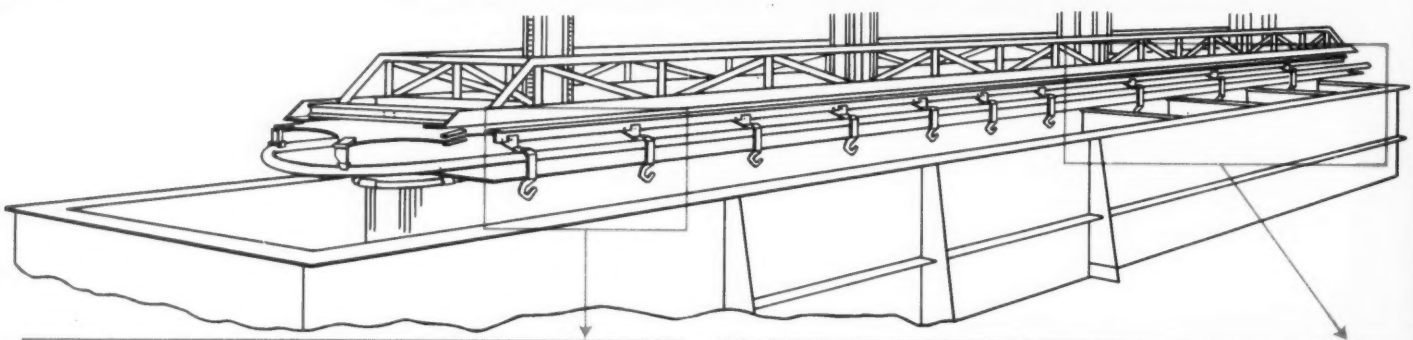
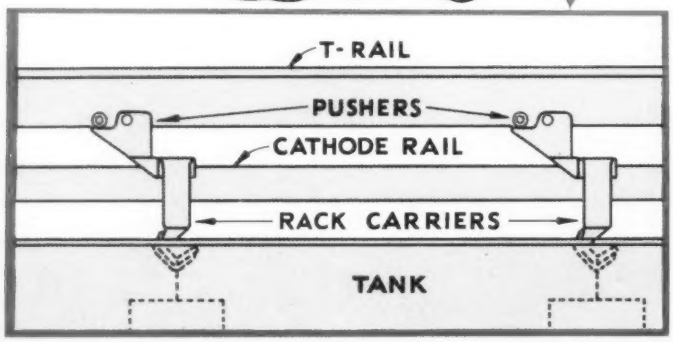
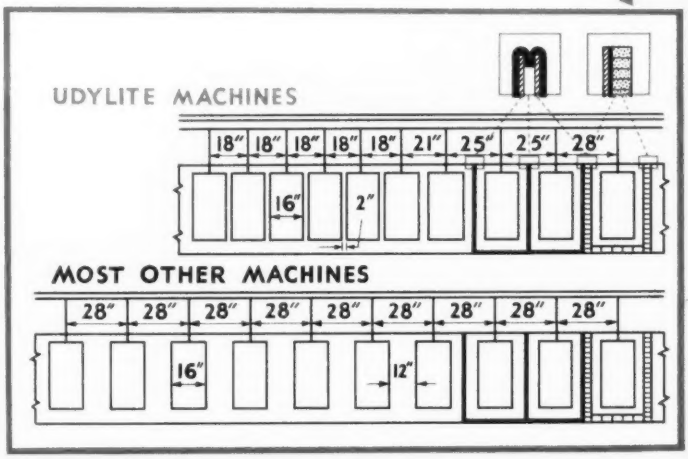
VARIABLE RACK SPACING—The drawings on this page illustrate the operation of Udylite exclusive variable rack spacing. A study of this and following pages will show the advantages of Udylite design. Here is how variable rack spacing will benefit you.

1. Allows for greater number of racks for any given length of machine. **2.** Saves on total machine length. **3.** Reduces floor space required in processing tank. **4.** Rack centers can be selected for best processing efficiency in that solution independent of rack centers in other tanks. **5.** Saves in gallonage of processing solutions required.



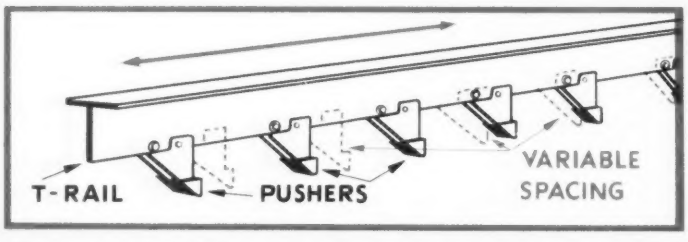


Udylite racks can be placed in the tanks exactly where you want them. This is accomplished by Udylite's ingenious but simple pusher mechanism. It eliminates the use of gears and chain which requires set distances of forward movement. Variable rack spacing allows *unlimited choice of rack centers in transfer or plating* for best operating conditions.

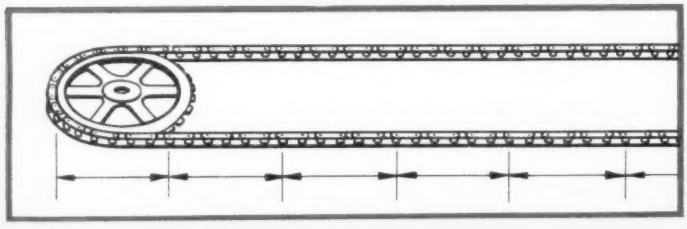


In the Udylite machine, different rack centers are no problem. They can vary in each tank regardless of different tank wall thicknesses. Rack center measurements in each processing tank are therefore chosen for the *best* processing efficiency in a particular solution regardless of the required centers in other tanks or the centers in transfer. In most other machines all rack centers are the same and are based on the width of the largest rack center used on the machine. The advantage of Udylite design is shown by the illustration above. In this example, one tank is brick lined, two are KOROSEAL* lined and the processing tank is steel. To obtain a 4″ rack clearance from tank walls, Udylite design allows for a minimum in rack center measurements where tank walls vary in thickness and permits a 2″ rack clearance in the processing tank. As can be seen, the Udylite machine will save 63″ in rack spacing for ten racks when compared to the spacings of other machines.

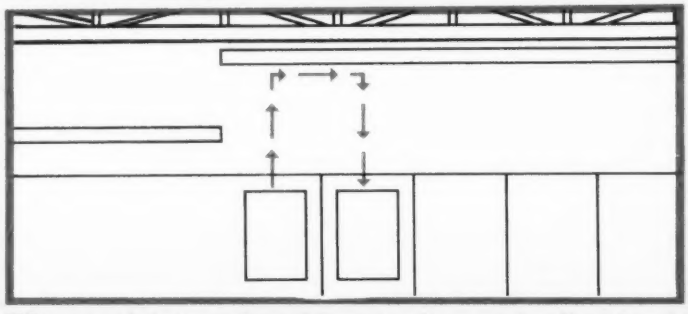
**B. F. Goodrich Company*



The exclusive Udylite pusher system works from a T-rail which moves back and forth. It operates hydraulically. Pushers are attached to the T-rail and can be positioned at any desired spacing. Future changes in rack size or plating time may be easily accommodated by simple change of pusher spacings.

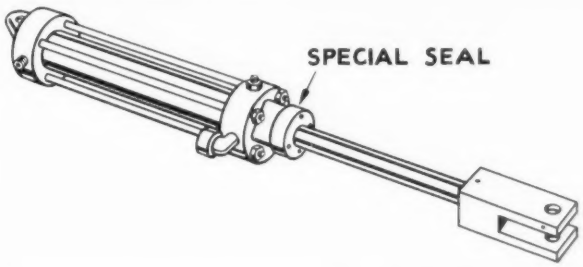


Udylite pusher system eliminates fixed carrier spacing necessary with chain driven machine.

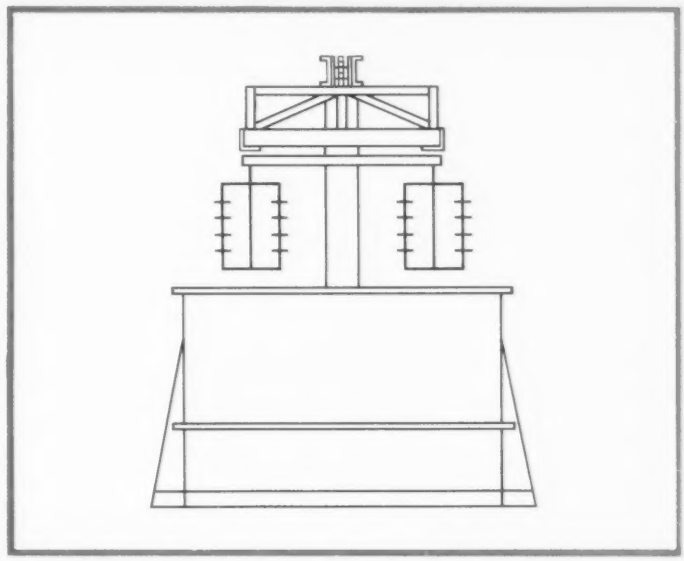


When work is transferred from tank to tank, all action is by square motion. This means minimum of forward travel.

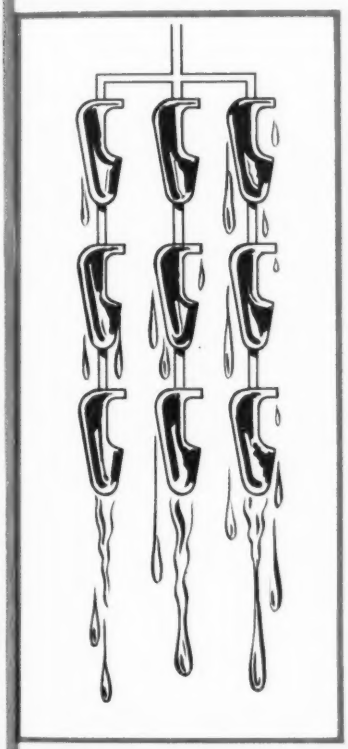
THESE OPERATING ADVANTAGES

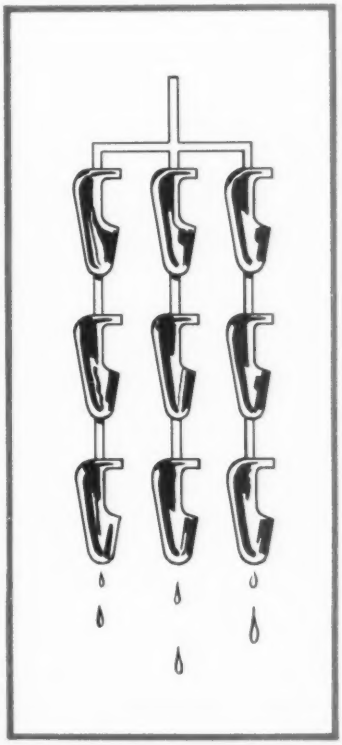


Lifting, horizontal movement and lowering of racks is done smoothly, effortlessly without jar or jerk by low-pressure hydraulic power with *separate speed controls for each movement.*

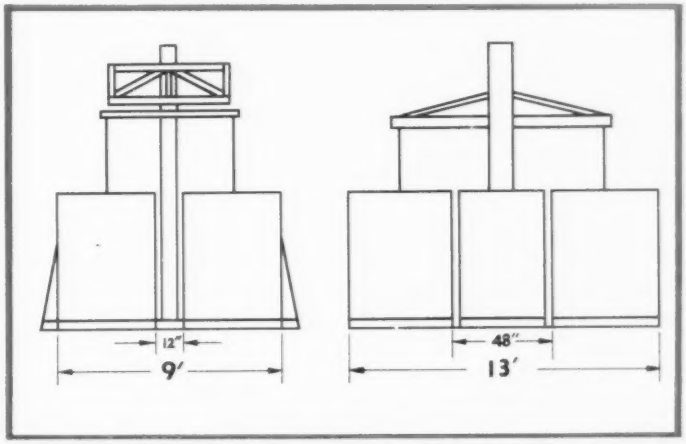


On Udylite machines, all work is lifted by powerful bridge-type superstructure, activated by a *low-pressure* hydraulic unit. Superstructures available for lifting racks in excess of 1000 pounds. There are no weight limiting arms on Udylite machines.

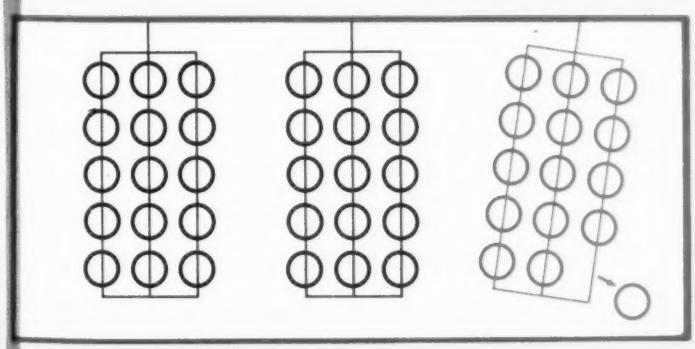




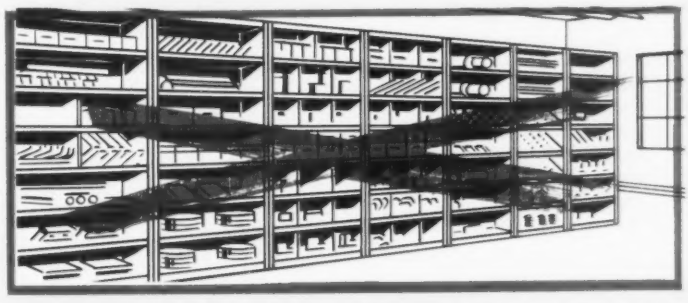
The smooth action of the hydraulic lift, usually set at not more than 40 feet per minute, greatly reduces dragout and solution contamination. The slow lift of work carriers allows surface tension to "wipe" most of the solution from the plated parts.



Most Udylite machines take up only twelve inches between tanks as compared to approximately forty-eight inches on other machines. *They are built and shipped on their own base.* As railway flat car or truck width limits are ten feet, this means Udylite machines can be shipped by truck or railway car in sections with tanks mounted do not need dismantling after factory run-in.

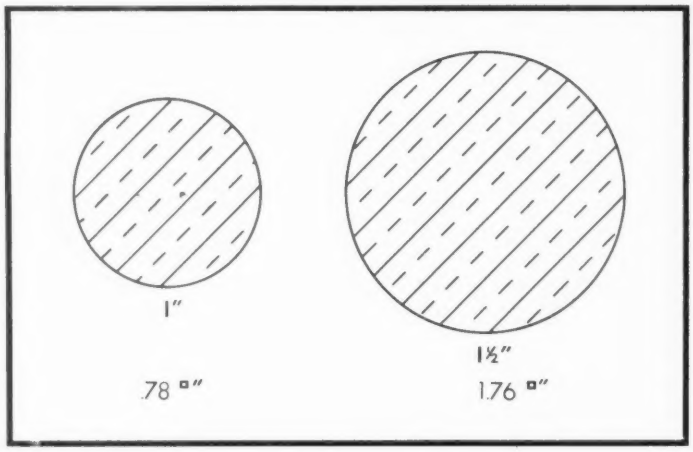


Use of hydraulic cushioned power and square transfer eliminates all whip and sway, even on racks up to eight feet long.

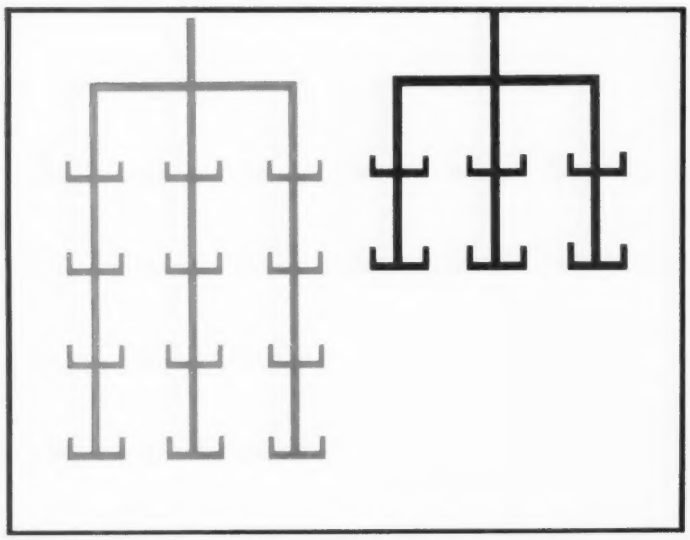


Because of its simplicity of design and fewer working parts, the stock of spare parts recommended for the Udylite automatic is amazingly small.

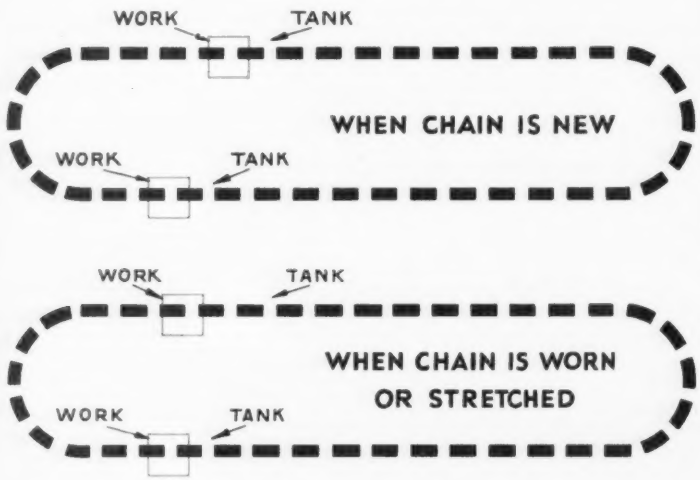
EXCLUSIVE UDYLITE OPERATING ADVANTAGES



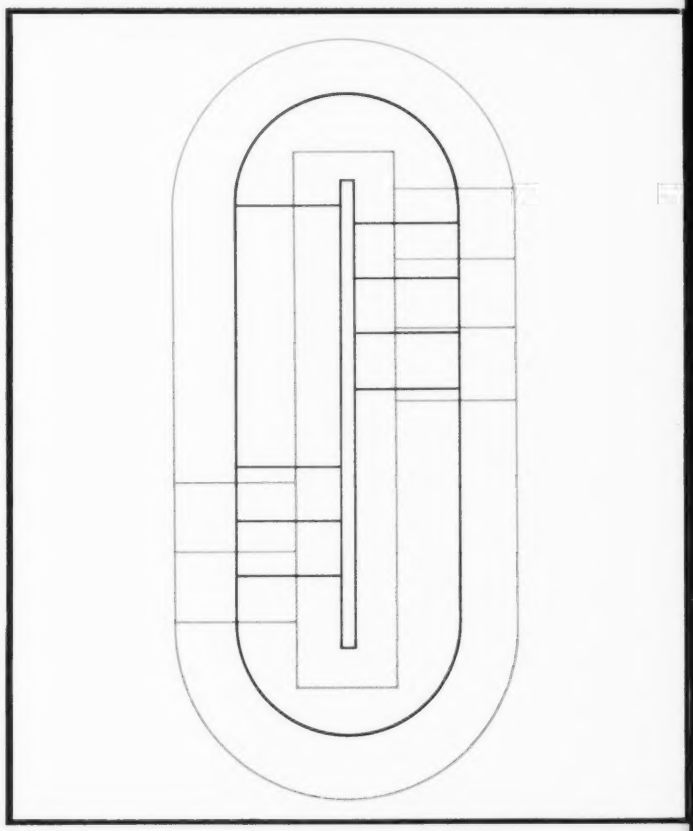
Udylite uses copper anode rods of 1½" diameter as standard. This allows for more current capacity. There is no sagging of rods under heaviest anode loads.



Only with the Udylite machine does the principle of operation readily lend itself to racks of extreme depth and up to 7 feet in direction of travel.



Udylite work carriers are positioned by pushers positively and exactly. Malfunction, due to chain stretch, wear or overtravel completely eliminated.



For an equivalent cycle and number of plating racks a Udylite machine will save approximately 4 feet in width and 20 percent in length.

UNMATCHED SERVICE POLICY

Before shipment of any Udylite machine, a layout print is mailed to the customer. This enables him again to check dimensions, make arrangements for water and electrical lines, for drainage, for steam and ventilation outlets. After checking, the print is returned to Udylite with the customer's approval.

After the return of the layout print and before actual shipment of the machine, a Udylite service man visits the customer, inspects the site, checks dimensions, water and electrical lines and other details preparatory to the installation of the machine. When the machine is built, the customer is notified and can make an inspection of the machine *in operation* at our plant. The customer is then notified of the date of shipment and arrangements are made for a Udylite service man to be at his plant when the machine arrives to assist in the installation.

A regular service program is a part of the Udylite policy. Each customer receives a routine call from a thoroughly trained and experienced Udylite factory service engineer once each six months to check the machine. And, of course, electrical, chemical or mechanical specialists are on call for any emergency. *These services are without cost to purchasers of Udylite Automatics.*

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

"symbols you can rely on"

● The seal of the United States when stamped on a silver dollar assures the holder that the coin is legal tender. As such, it is accepted throughout the world in payment for goods and services.

The Mutual seal is accepted by chromium chemical buyers with a comparable degree of confidence. Over the years Mutual has acquired an enviable reputation for quality products and dependable performance. If you are not now using Mutual Chromic Acid, we would be glad to consult with you on the merits of our products and service which lead so many to rely on the Mutual trade mark.

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POTASSIUM BICHROMATE

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Special Reports On Finishing Non-Ferrous Metals

NUMBER II—Paint Base, Corrosion-Resistant Finishing with Iridite

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are well known and accepted throughout industry as an economical means of providing corrosion protection, a good paint base and decorative finishes for non-ferrous metals. However, continued developments have been so rapid and widespread that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this digest of current information; to bring you up to date on the many ways in which you can obtain proper surface preparation for painting and increase product durability with a single multi-purpose chemical pretreatment. Report I on decorative, corrosion-resistant finishes and Report III on chemically polished, corrosion-resistant finishes are available on request.

First, it is an accepted fact that metal surfaces should be prepared before painting to make possible an efficient paint system. Naturally, this preparation should provide for good initial paint adhesion. Chemical treatments have proved extremely effective in this respect, particularly those of a neutral or preferably acid nature. Further, to be most efficient, chemical treatments should provide a non-porous barrier to maintain adhesion by sealing the metal from the paint and moisture. They should also provide a self-healing film which prevents lateral corrosion in the event that bare metal is exposed through scratching.

The Iridite chromate conversion coatings meet all these requirements. Iridite is a chemical conversion treatment for surface preparation. It provides initial paint bonding by molecular adhesion. It is acid in nature and produces a film that is gel-like and non-porous in structure. Thus, the Iridite film effectively seals the metal from the paint and from moisture penetration. Because the film contains certain relatively soluble constituents, it will protect areas scratched through to bare metal and prevent lateral corrosion. This is accomplished by a gradual leaching of these constituents into the damaged area.

Further, because of its gel-like, non-crystalline nature, the Iridite film will not affect the appearance or texture of the paint film, nor will it dust or powder to mar the painted surface. Because the film is non-porous, paint coverage is increased, thus substantial savings in paint costs will be realized. In addition, treated parts may be stored for long periods of time prior to painting without the risk of entrapped moisture causing blistering when painting.

Iridite chromate conversion coatings are widely used with equal ease and success under both baked and air-dried paint systems. While the actual adherence properties of the Iridite film do not increase appreciably with its thickness, corrosion protection does. The protection of the Iridite film is proportionate to its thickness and should be taken into consideration when selecting the Iridite to meet your needs. However, it is sometimes necessary to sacrifice maximum corrosion protection for appearance when a finished part is to be only partially painted. For example, it may be desirable to use a thin, clear, bright Iridite film if the unpainted areas must present a chrome-like appearance. A typical case is that of instrument housings on which the exterior is painted and the inside left unpainted.

On the other hand, if all surfaces of the product are to be painted and maximum corrosion protection is required, the heavier and most protective Iridite films should be used. For example, all surfaces of zinc die cast fruit juicers are finished with a highly protective Iridite film prior to painting to provide maximum resistance to the corrosive action of fruit juices.

Iridite finishes are now available for all commercial forms of the more commonly used non-ferrous metals, including zinc, cadmium, aluminum, magnesium, silver, copper, brass and bronze. In addition to providing an excellent base for paint, the Iridite films also have high decorative value when used as final finishes in themselves.

These films can produce a wide variety of pleasing appearances including clear bright, iridescent yellow, bronze, olive drab and brown. In addition, many films can be modified by bleaching or by dyeing. Among the dye colors available are various shades of red, yellow, green, blue or black.

In planning or designing, you should consider the many other characteristics of Iridite finishes which may enter into the specific problem. In addition to their functions as protective and decorative finishes, and as bases for organic finishes and bonding compounds, Iridites have low electrical resistance. Some can be soldered and welded. The film does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product requires the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

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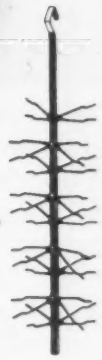
LOOK! they're brand new and BARGAIN PRICED!

Belke Ready-Made "ECONOMY" RACKS*

100% COPPER Spines . . . Bronze Tips!
All Coated with Universal Plastisol!

- all racks are 30" length except Style H which is 8⅝" long
- distance from hook to first tip is 9½".



STYLE A
diameter—.114"
tip width—6½"
distance between tips—2¼"
$5.78

STYLE B
diameter—.114"
tip width—7½"
distance between tips—4½"
$4.77

You get "can't be made better" quality that has made the Belke brand famous throughout the years, and at prices SO LOW you can't make racks like these yourself for less! Why? Because Belke has "tooled-up" to produce these "Economy" racks in huge quantities . . . and that means worth-while savings that go directly to you! The proof is found in the price! Yes, and here's more good news: Belke intends to carry a large stock *on hand* to give you IMMEDIATE DELIVERY!

These racks are designed for a large variety of pieces, and for ready availability at low cost when you need racks in a hurry!

STYLE C
(heavy riveted only)
diameter—1/16"
tip width—4½"
distance between tips—2¼"
$6.00

STYLE D
diameter—.093"
tip width—6½"
distance between tips—2¼"
$5.83

STYLE E
diameter—.093"
tip width—6½"
distance between tips—4½"
$4.42

HERE'S WHY BELKE "ECONOMY" RACKS ARE BEST:

- ***ONE PIECE ALL COPPER SPINES—not part iron—part copper frames!***
- ***FULL AMPERAGE right to the part results in better plating!***
- ***ALL TIPS are riveted and soldered or brazed for continuous conductivity and rigidity!***
- ***ALL CONTACT WIRE TIPS are Phos. Spring Bronze!***
- ***100% SOLIDS PLASTISOL INSULATION resistant to ALL plating cycles . . . the best money can buy!***

CUSTOMER COMMENTS:

"These ECONOMY racks cost so little that they pay for themselves in about a week!"

"You should have made racks like these 30 years ago."

"They fit so many jobs and cost so little I can't afford to be without them."

"I don't see how you do it — they're certainly low priced."

"I know a bargain when I see one — send my order at once!"

"If I use them 50 times they're paid for."

"Even if I break some tips, I can well afford to throw them away — my investment is so small."

STYLE F
diameter—1/16 x ½"
tip width—7½"
distance between tips—4½"
$5.84

STYLE G
diameter—1/16 x ½"
tip width—7½"
distance between tips—4½"
$5.69

STYLE H
6 holes—2" apart
$2.45
(charge of 25c for 6 holes drilled and tapped, screws furnished.)

send your order direct or write for name of your local representative.

Belke MANUFACTURING CO.
EVERYTHING FOR PLATING PLANTS
947 N. Cicero Ave., Chicago 51, Ill.

- *prices subject to change without notice.*
- *for lots of less than 12 racks: slight additional packaging charge of $1.50 per shipment*

you expect top quality from Belke . . . . and you get it!

*"Economy" rack tips are rigidly fastened to spine and do not afford the features found ONLY in the Belke THINKER BOY racks with replaceable tips.

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PRODUCTION FINISHING

Production finishing demands not only high output at low unit cost, but also a uniform finish meeting required standards. Acme Automatics can be depended upon to deliver high production at minimum cost and maintain your finish requirements. Acme performance has been proved in production for nearly half a century.

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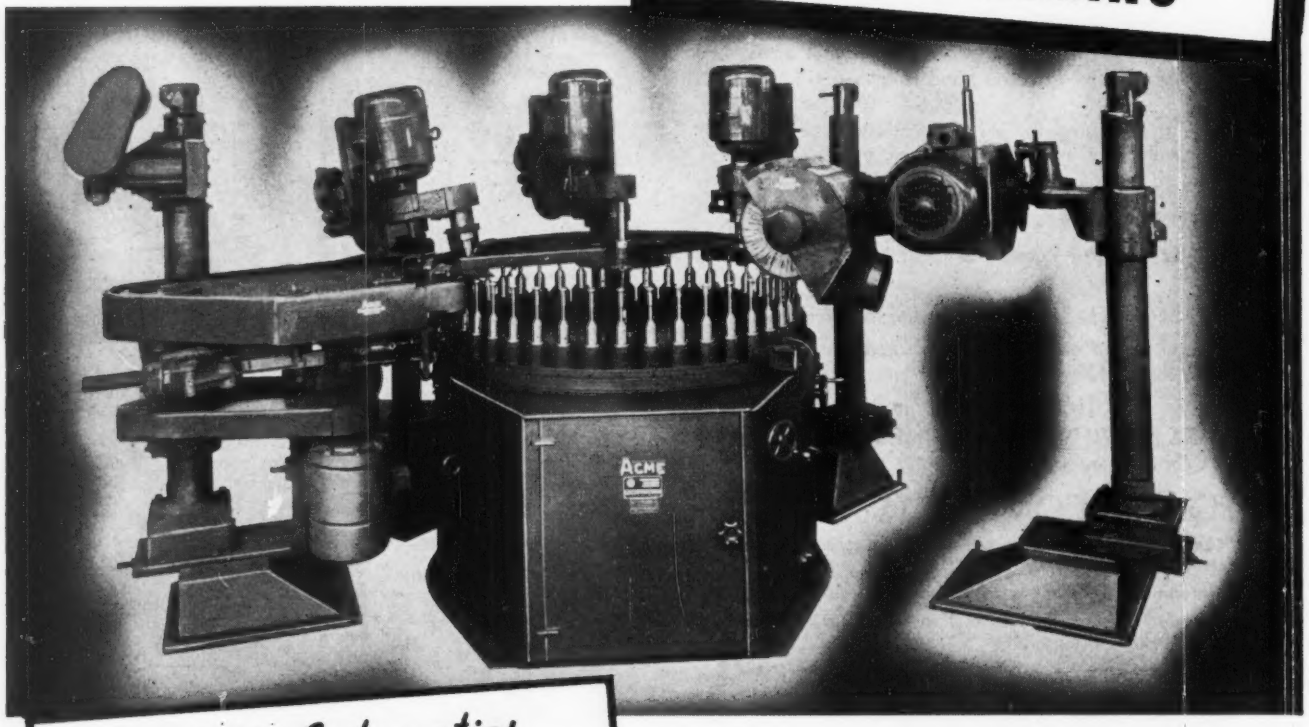
DE-BURRING
WIRE BRUSHING
MICRO-FINISHING



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STRAIGHT LINE *Automatics*
SEMI-*Automatics*
Catalogs on Request

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For recommendations, send blue prints of part or samples before and after finishing operations, together with detailed information on finishing operations and production requirements. If production methods will cut your costs, we can set your job up in our experimental processing department and you can inspect the machines in operation.

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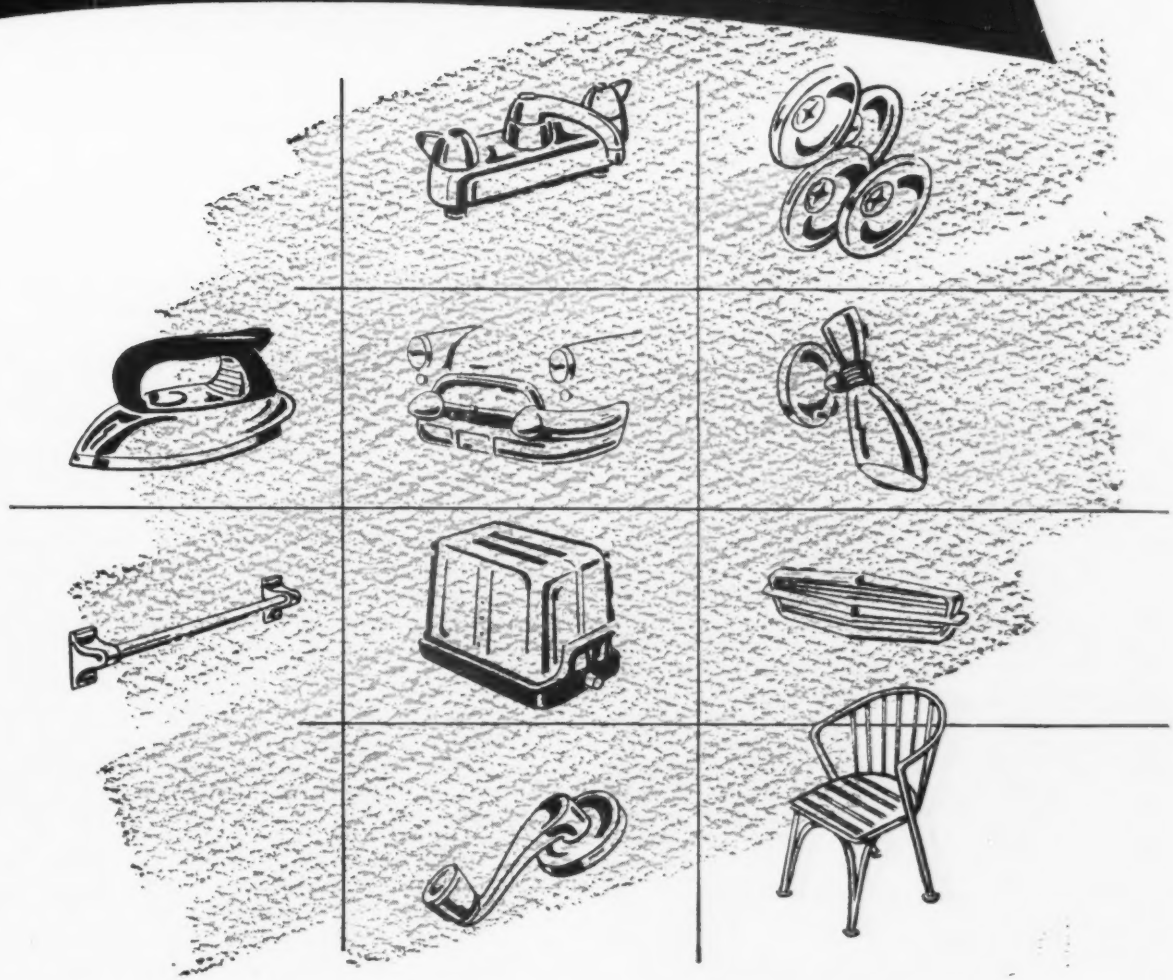
HARSHAW Nubrite

long, bright nickel plating operation without treatment



Other outstanding advantages are:

BRIGHT OVER WIDE RANGE
from a few amperes/ft.^{2}
to well over 100 amperes/ft.^{2}

HIGH TOLERANCE to common impurities

HIGHLY RECEPTIVE to chrome

EXCELLENT LEVELING

BETTER BRIGHTNESS with thinner deposits.

SIMPLE OPERATION and CONTROL
Plates brightly from 120°F to 155°F.
pH can vary over a wide range
Liquid addition agents.

REMAINS DUCTILE AFTER LONG OPERATION

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"Blast" off heaviest smuts

with PENNSALT ELECTROCLEANER K-8

Pave the way to a smooth, bright plate with minimum rejects—use Pennsalt Cleaner K-8*, the KING OF ELECTROCLEANERS.

The high conductivity of K-8 lets high currents flow at moderate voltages, produces a strong electrolytic "scrubbing" action that removes the most stubborn heat-treating smuts, impacted mill oils, and drawing compounds. A new combination of surfactants and balanced alkalies in K-8 gives you cleaner steel or copper for a consistently better plate. And, once removed, soils are prevented from redepositing; suspended by the K-8 solution, they're easily rinsed off even in hard water.

Remember—where other cleaners fail, Pennsalt Electrocleaner K-8 cleans deep and sure. TRY K-8 IN YOUR CYCLE. Ask the Pennsalt man for a demonstration, or write Metal Processing Dept. 234, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia Street, Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

*PENNSALT K-8 IS A TRADEMARK OF PENNSYLVANIA SALT MFG. CO.

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"Non-Slaking" Lime Compound

NO DETERIORATION . . . finally a lime buffing compound that can be left open for a month or more without deteriorating. RADIANT WHITE FINISH is GUARANTEED to buff better or equal to any lime compound made and keep in fibre tubes for a year.

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Grease Stick
Stainless Steel
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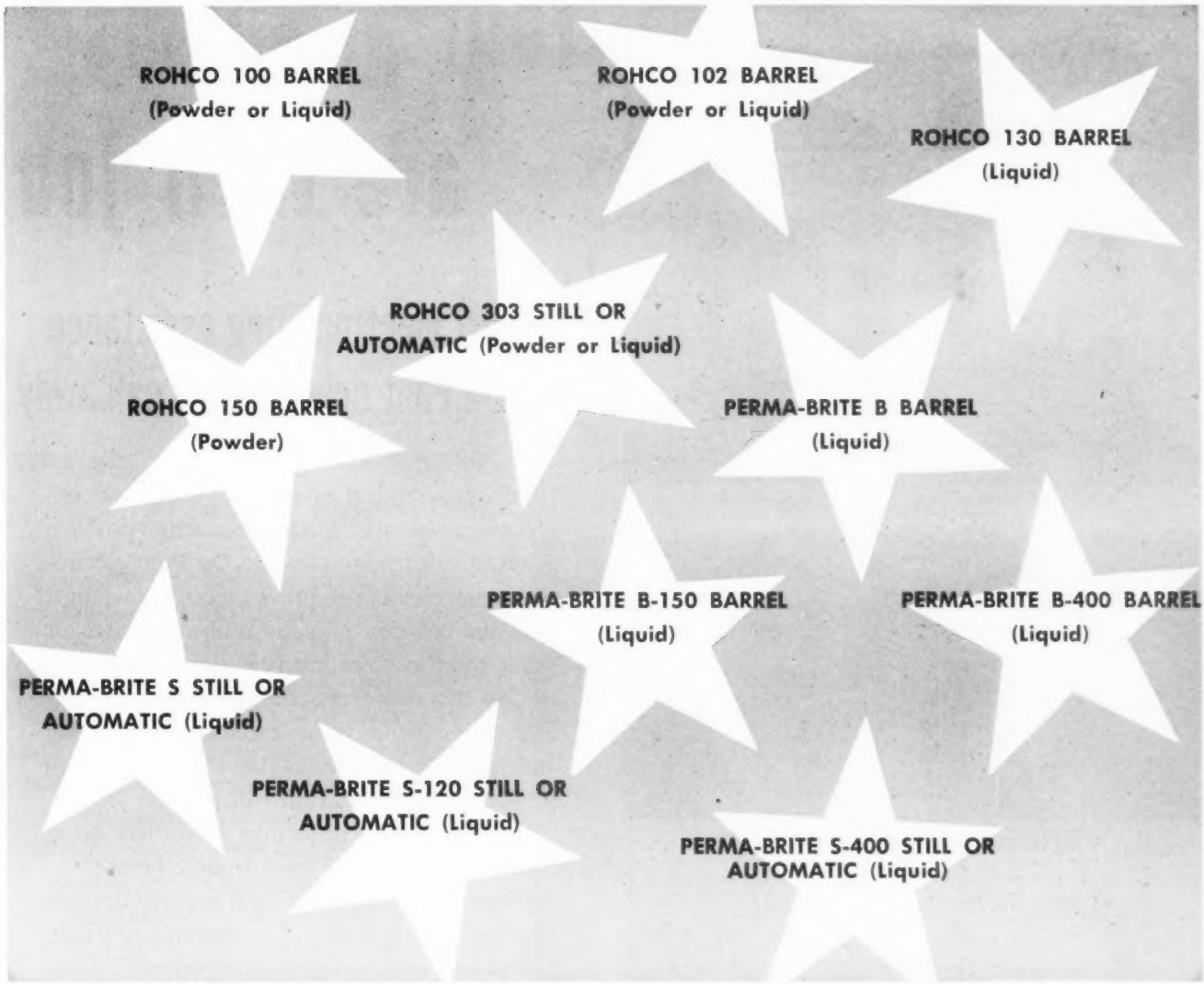

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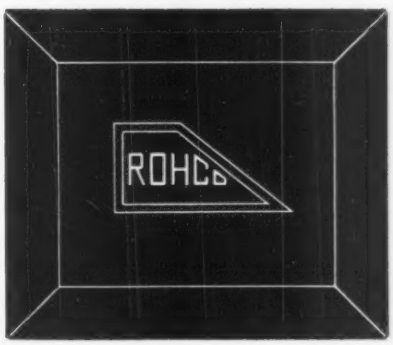

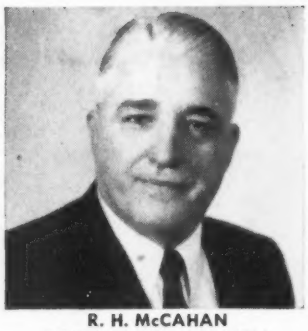

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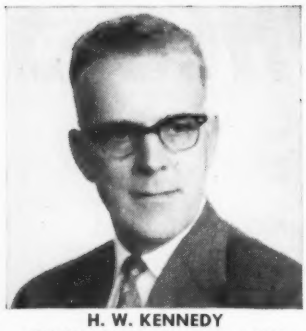

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NORMALIZES COLD-ROLLED FRAMES AND WELDS BY SPECIAL ANNEALING

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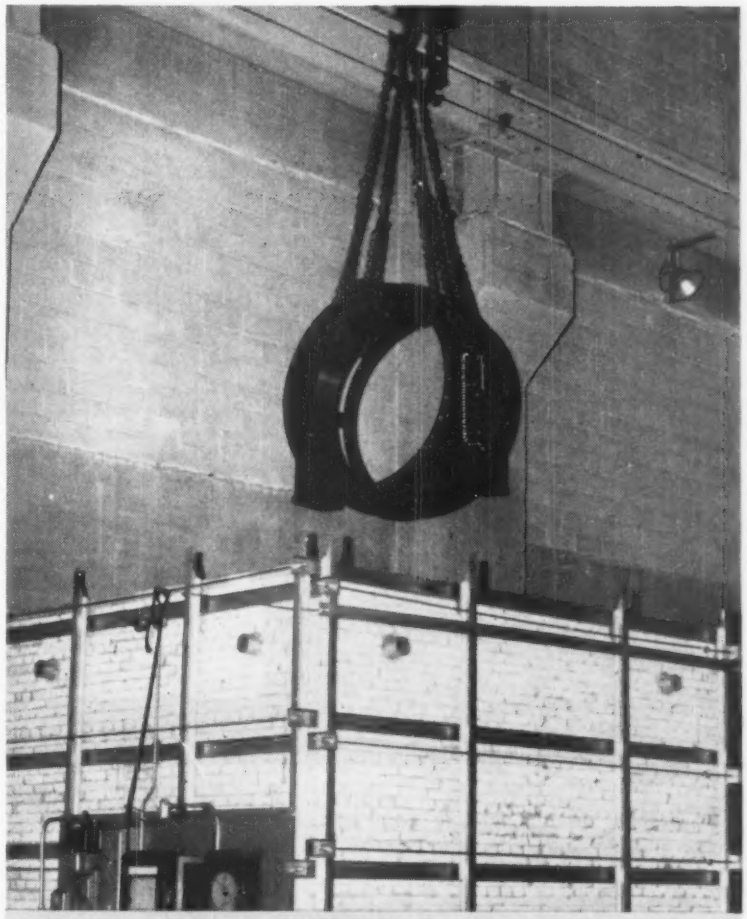

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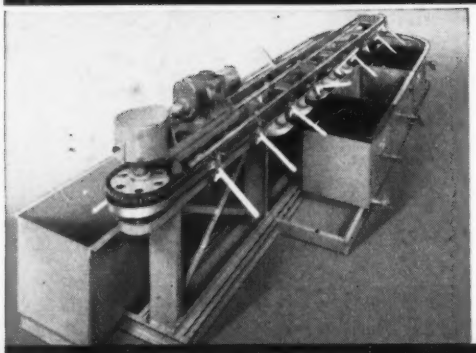
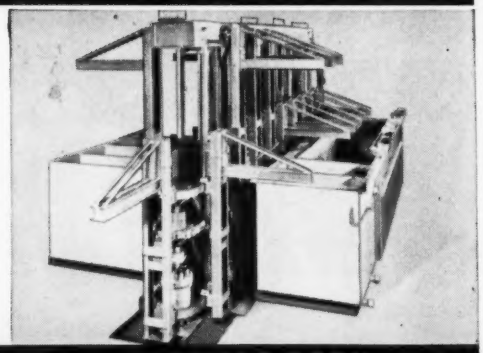


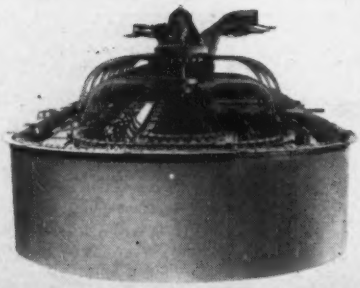
Low initial and low operating costs are features of this newly introduced small automatic which has a big capacity for its size.

"LITTLE STEVE"
Rack Type Machine

Unit's load capacity, mechanical flexibility and lift design meet tomorrow's increased safety and production requirements.



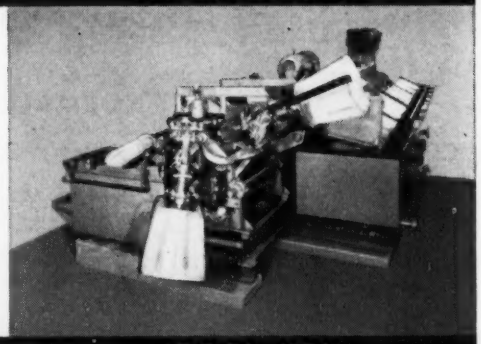
"STEVADOER"
Rack Type Machine



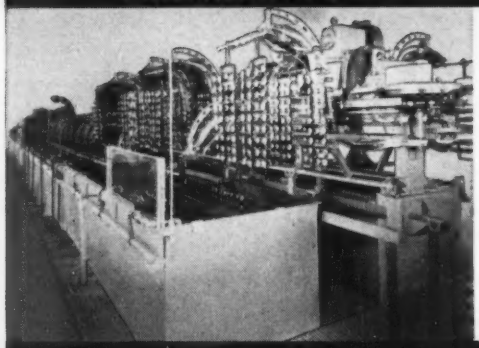
A compact automatic processing machine, embodying the famous Stevens auxiliary cam shaft and lifters for rapid vertical transfer.

MODEL "A"
Rack Type Machine

A proven automatic barrel machine for plating and processing small parts. Only unit with fully automatic load and unload features.



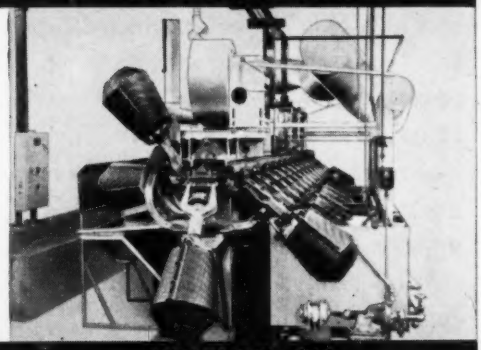
MODEL "C"
Barrel Type Machine



Features rapid, continuous movement processing employing hump type cams. Design permits utmost mechanical and cycle flexibility.

MODEL "B"
Rack Type Machine

Large capacity automatic barrel unit for volume production. Embodies major features of the famous Stevens Model "C" machine.



"SUPER E"
Barrel Type Machine

The Stevens family is now complete. Six Stevens automatic plating and processing machines fill every need for metal finishing.

Latest addition to the complete line of Stevens automatic metal finishing machines is "Little Steve." Announcement of the new "Little Steve" follows by a few months the recent introduction of Stevens heavy-duty "Stevadoer" Processing machine.

Now you can go automatic in any and all of your plating operations. Stevens can furnish a job-engineered, cost-cutting, fully automatic machine that will answer every production need whether it be for electroplating, cleaning, anodizing, bright dipping. You will get better control, better finishes and eliminate rejects with Stevens Automatics.

Why not see how one of Stevens great family of automatics can be engineered for your metal finishing operations? Call in a Stevens Sales Engineer today or write direct to –

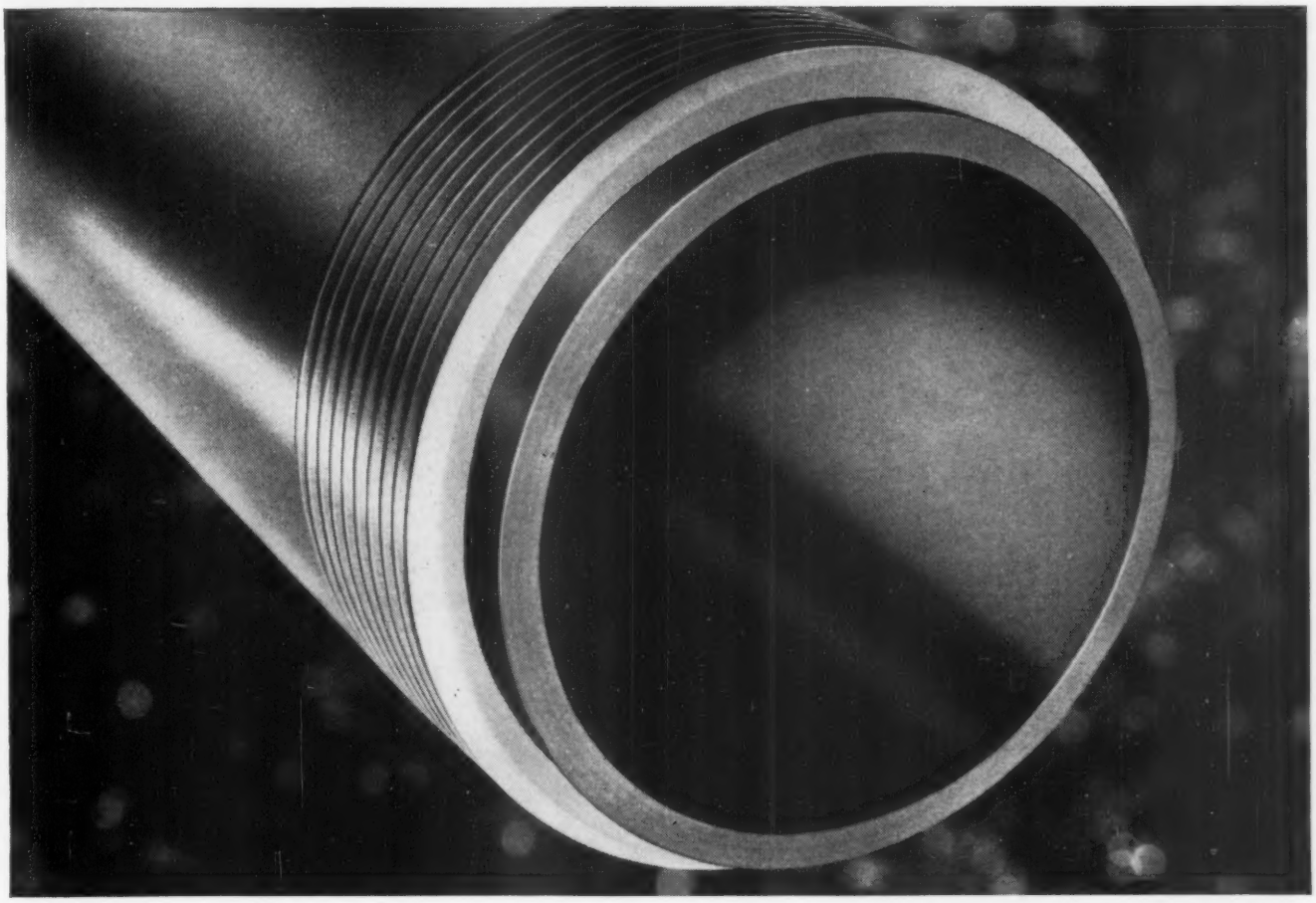
BRANCHES: BUFFALO • INDIANAPOLIS • NEW HAVEN
Offices in Principal Cities

FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

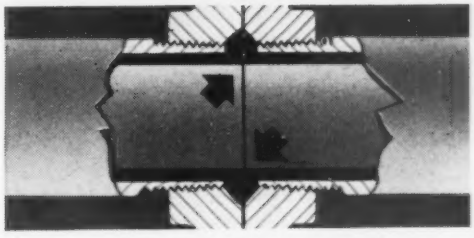
Metal Finishing equipment and supplies from castings or stampings to finished product.

FREDERIC B.
STEVENS
INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

DOW



You can see why Saran Lined Pipe prevents corrosion



Liquid never touches metal in Saran Lined Pipe even at a flanged connection like this.

Acids, alkalis and other corrosive liquids never touch the rigid steel pipe . . . it's continuously lined with durable, corrosion-resistant saran

Say good-by to corrosion problems when you install saran lined pipe, fittings, and valves. This combination of corrosion-resistant saran swaged into rigid, non-bursting steel has a proved record of corrosion prevention in the chemical, petroleum, waste, pulp and paper, metal finishing and food processing field.

Saran lined pipe, fittings and valves form tight, snug, leakproof joints . . . is available for working pressures up to 150 psi. Fittings and valves are also available in steel for working pressures to 300 psi. You'll be amazed how easy and economical it is to install this modern piping, too. For it can be cut and threaded in the field with available pipe fitters' tools. And because it's rigid, a minimum of supporting structures are needed.

For further information on saran lined pipe, fittings, and valves send in the coupon on the right today. THE DOW CHEMICAL COMPANY, Midland, Michigan.

Saran Lined Pipe Company
2415 Burdette Avenue
Ferndale, Michigan

Dept. SP627C

Please send me information on saran lined pipe, valves, and fittings.

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Company_____

Address_____

City_____ State_____

Saran Lined Pipe is Manufactured by The Dow Chemical Company, Midland, Michigan

you can depend on DOW PLASTICS

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"REMINDS ME OF MY *PACKER-MATIC* UNIFORMITY"

PACKER-MATICS ability to polish and buff your product with the highest degree of uniformity . . . automatically at high speed . . . affords plenty of profit opportunities for you.

As the products move from station to station, precisely angled and evenly dressed wheels produce consistently better finishes in a fraction of hand operation time . . . automatically.

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CHECK THESE PRICES

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6 volts, 1500 amps . .	$1565.00
12 volts, 1000 amps . .	$1616.00
12 volts, 2000 amps . .	$2465.00

NOW EVERY PLATING SHOP can take advantage of the long life and operating savings of germanium with:

1 **THE UNIQUE G-E TRUE HERMETICALLY SEALED GERMANIUM CELL**—that safeguards the germanium from corrosive atmosphere.

2 **THE UNIQUE G-E GERMANIUM PROTECTIVE SYSTEM**—the first protective device designed specially to help safeguard the germanium cell against all types of overloads. Provides an original advance-warning feature to help prevent costly, sudden shutdowns.

3 **GENERAL ELECTRIC EXPERIENCE IN GERMANIUM**—over 13,000 kilowatts (2,000,000 amperes at plating voltages) of germanium rectifiers installed and operating. General Electric Co., Schenectady 5, N. Y. 463-14

GENERAL ELECTRIC

Prices refer to integral tap switch unit shown here.

CALL YOUR AUTHORIZED GENERAL ELECTRIC PLATING AGENT TODAY.

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THE CHEMICAL CORP., Springfield, Mass.
CLEVELAND ELECTRIC CO., Atlanta, Ga.
DAVIES SUPPLY & MFG. CO., St. Louis, Mo.
DONALD SALES & MFG. CO., Milwaukee, Wisc.
FITZPATRICK ELECTRIC SUPPLY CO., Muskegon, Mich.
COMCO, INC., New Haven, Conn.
W. M. FOTHERINGHAM CO., Buffalo, N. Y.
GENERAL ELECTRIC SUPPLY CO., Cleveland, Ohio
FRED GUMM CHEMICAL CO., Kearny, N. J.
J & H ELECTRIC CO., Providence, R. I.
LASALCO, INC., St. Louis, Mo.
LEA MANUFACTURING CO., Waterbury, Conn.
WILLIAM LYNN CHEMICAL CO., INC., Indianapolis, Ind.
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MEAKER CO., Cicero, Ill.
THE REYNOLDS CO., Philadelphia, Pa.
STANDARD PROCESS CORP., Chicago, Ill.
UDYLITE CORP., Detroit, Mich.
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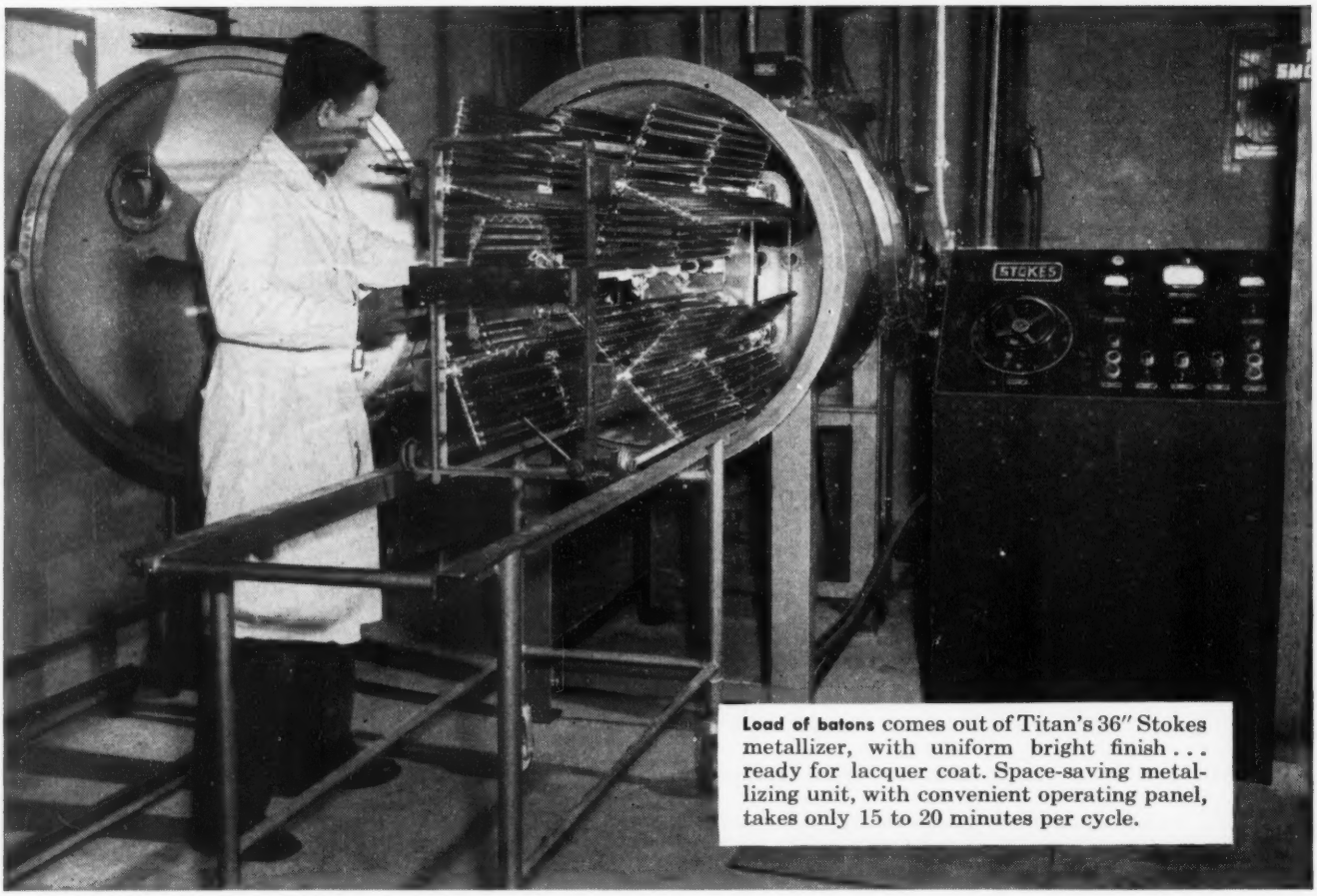


Load of batons comes out of Titan's 36" Stokes metallizer, with uniform bright finish . . . ready for lacquer coat. Space-saving metallizing unit, with convenient operating panel, takes only 15 to 20 minutes per cycle.

How "vacuum plating" . . . using Stokes metallizers . . . can cut metal finishing costs

At Titan Valve & Mfg. Co., metal parts plated in a Stokes metallizer get a finish as attractive as polished chromium . . . in brilliant colors if desired . . . at costs substantially lower than for electroplating.

Vacuum metallizing, widely used for bright finishing of plastics and other non-metals, also proves highly useful and economical on many metal parts. The experience of Titan Valve & Mfg. Co. of Cleveland, is typical of the results that can be obtained by this process. This company does a large volume of custom finishing of varied metal goods, including tubes for batons, zinc-base die-cast valve knobs and indicator dials . . . which they "vacuum plate" with aluminum in their Stokes Model 428 metallizer.

Durable finish. On the basis of performance tests, the metallized finishes are equal in durability to the best baked lacquer or enamel.

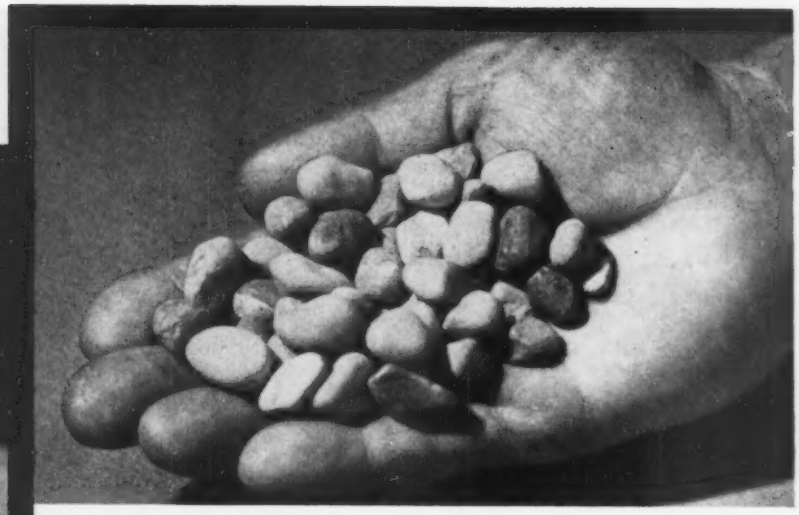
Low production cost. The vacuum metallizing process costs less per piece than either plated or anodized finishes where buffing or polishing is required.

Low equipment investment. Total cost of the metallizing equipment and auxiliaries is only about half that of comparable electroplating equipment. The same equipment, moreover, can be used to bright finish a great variety of pieces simultaneously.

Specialists in high vacuum equipment for more than 30 years, Stokes makes a varied line of metallizing units, in sizes to fit your production requirements. Write to Stokes for literature, and for a personal discussion by a Stokes engineer on your specific application.

High Vacuum Equipment Division
F. J. STOKES CORPORATION
5518 Tabor Road, Philadelphia 20, Pa.

STOKES



TUMBLEX "N" ABRASIVE, for high lustre, especially on die castings and soft metal. Rounded uniform shape brings out the most desirable color of the finished parts. Available in seven sizes.

ALUNDUM* TUMBLEX "A" ABRASIVE, for general barrel finishing. Can perform several operations in one: removes flash, heat treat scale, tool marks, deburrs, forms radii, and finishes to desired microinch. Available in eleven sizes.

ALUNDUM TUMBLEX "T", a bonded, triangular shape, fast cutting tumbling abrasive for special shaped parts. The triangular shape prevents wedging in work slots or holes. Available in four sizes.

Barrel finishing is producing sensational results

...and 3 Norton TUMBLEX Abrasives lead you to the best method

Here are three steps that may yield some interesting advantages to you.

First, check your present method of deburring and descaling. If it is slow and costly, it is quite likely that barrel finishing can do it better, faster and cheaper.

Second, check the three Norton Tumblex materials shown above and decide if their properties would be suitable for your requirements.

Third, send us some work samples with a description of the results wanted — and include a finished piece. We will tumble the samples and return to you with full information covering the material and method used. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., a division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-308

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ABRASIVES

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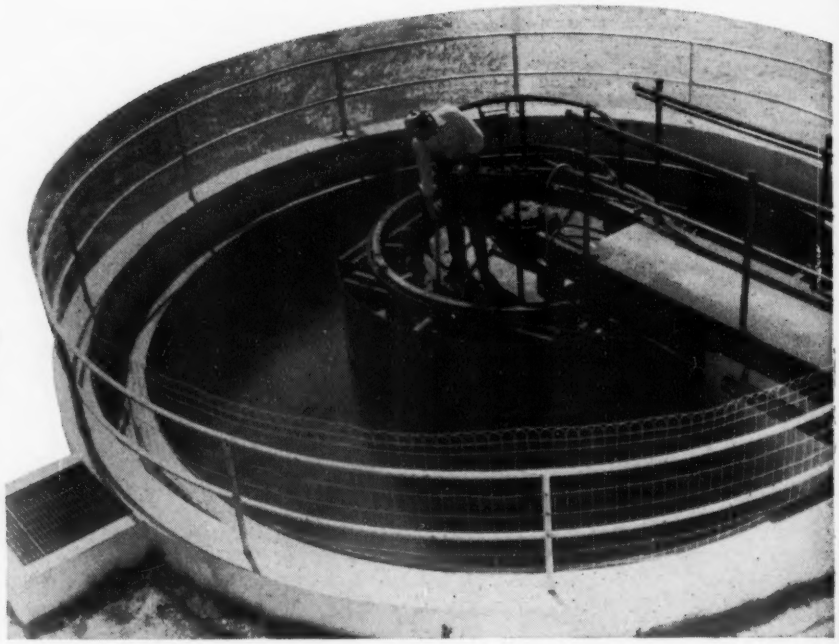
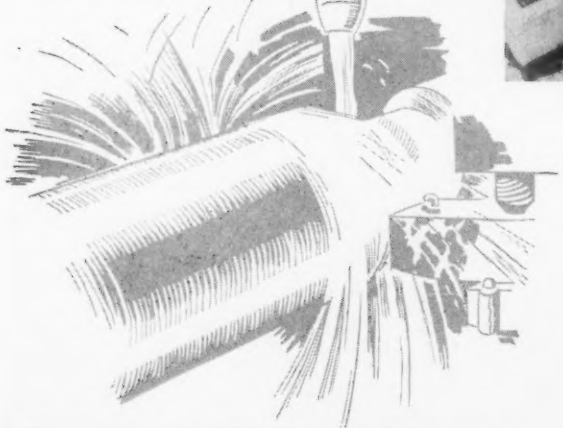
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones Pressure-Sensitive Tapes

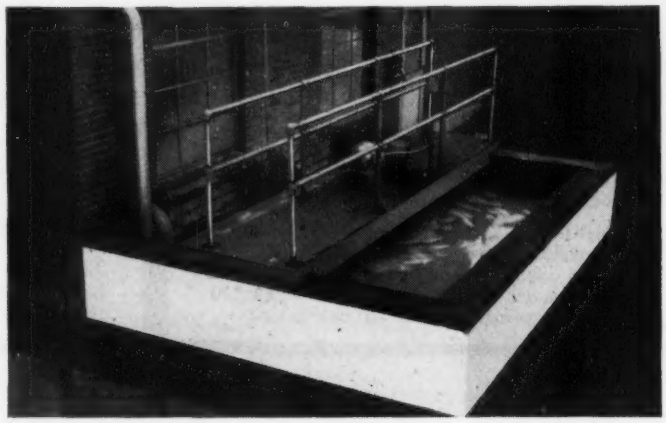
Disposal of metal finishing wastes—as easy as 1-2-3!





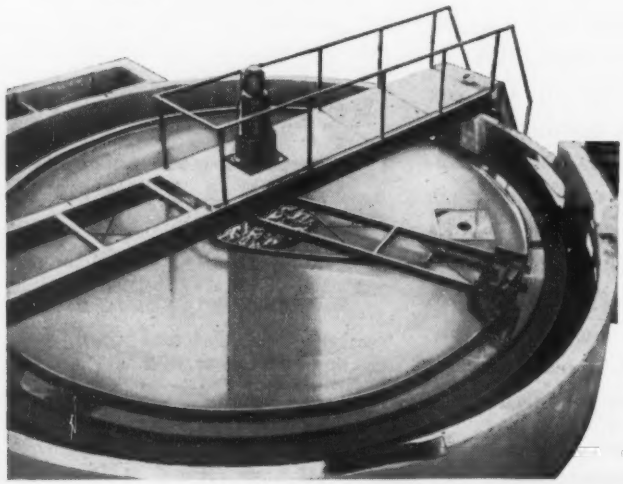
Treatment of pickle liquors, detergents, plating solutions, coolants and rinse waters is rapid and economical when you use INFILCO equipment. One or more of the units shown here will provide a permanent solution for your waste disposal problem.

1. CYCLATOR® Clarifier: A high-capacity unit for removing metals, soluble oils and suspended solids, and for pH adjustment.



2. VORTI-MIX® Circulator: For primary treatment of plating wastes which contain chromates and cyanide. Also applied to pickle liquor neutralization and cracking of oil emulsions.

3. PRIMARY CLARIFIER: For recovery of oil and removal of settleable solids when two stage treatment is required.



The proven success of this equipment in the metal finishing industry is your assurance of satisfaction. See your consulting engineer or write for complete information.

INFILCO

The one company offering equipment for all types of water and waste treatment—coagulation, precipitation, sedimentation, filtration, flotation, aeration, ion exchange and biological processes.

INFILCO INC.
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5522A

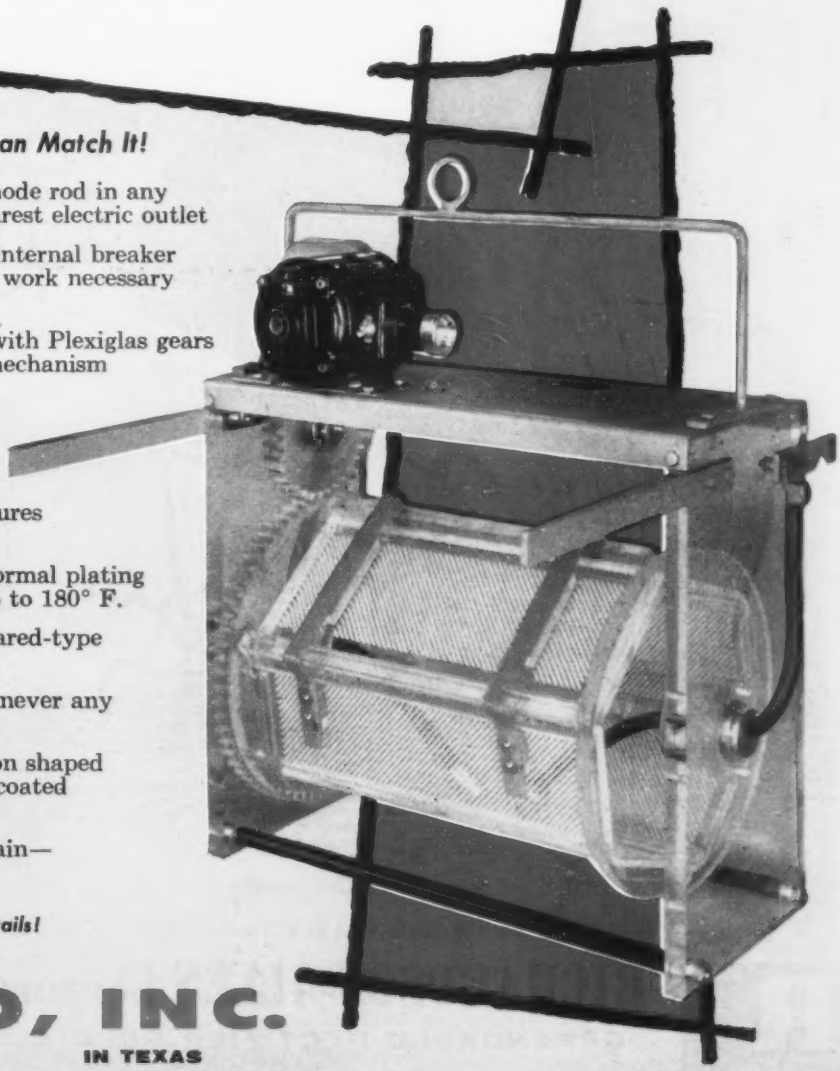
Better, Faster, Lower Cost Plating of Small Lots!

NEW! LASALCO'S Model 9 x 15 Utility BARREL PLATER

with High Temperature Plexiglas Cylinder

No Other Plater At Its Price Can Match It!

- Easy! Just hang it on the cathode rod in any plating tank and plug into nearest electric outlet
- Hexagon shaped cylinder has internal breaker strips to insure interchange of work necessary for more uniform plating
- Positive smooth 3-gear drive with Plexiglas gears eliminates plate-up on drive mechanism
- Dragout loss is cut to a minimum because barrel rotates as it is lifted from solution
- Double flexible connection insures positive contact
- Plexiglas cylinder resists all normal plating solutions and temperatures up to 180° F.
- Rugged, specially designed geared-type motor
- Nothing plates but the load—never any tree-up on cylinder
- Cylinder size 9″ x 15″. Hexagon shaped with removable door. Plastic-coated spring-type latches
- Easy to clean—easy to maintain—economical to operate



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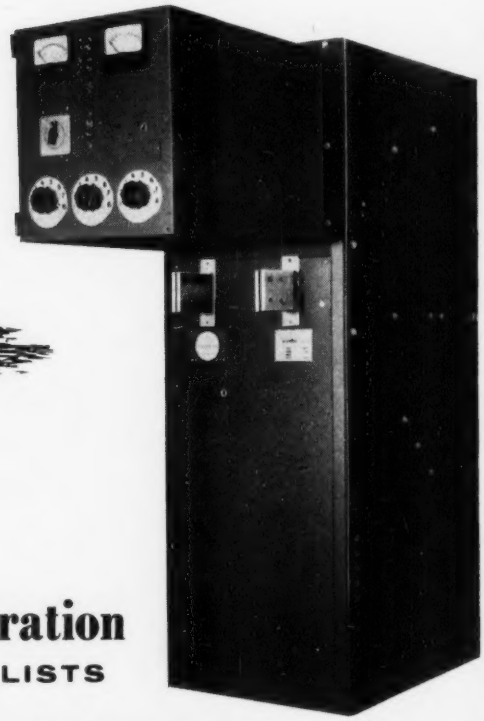

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a Manufacturing affiliate of

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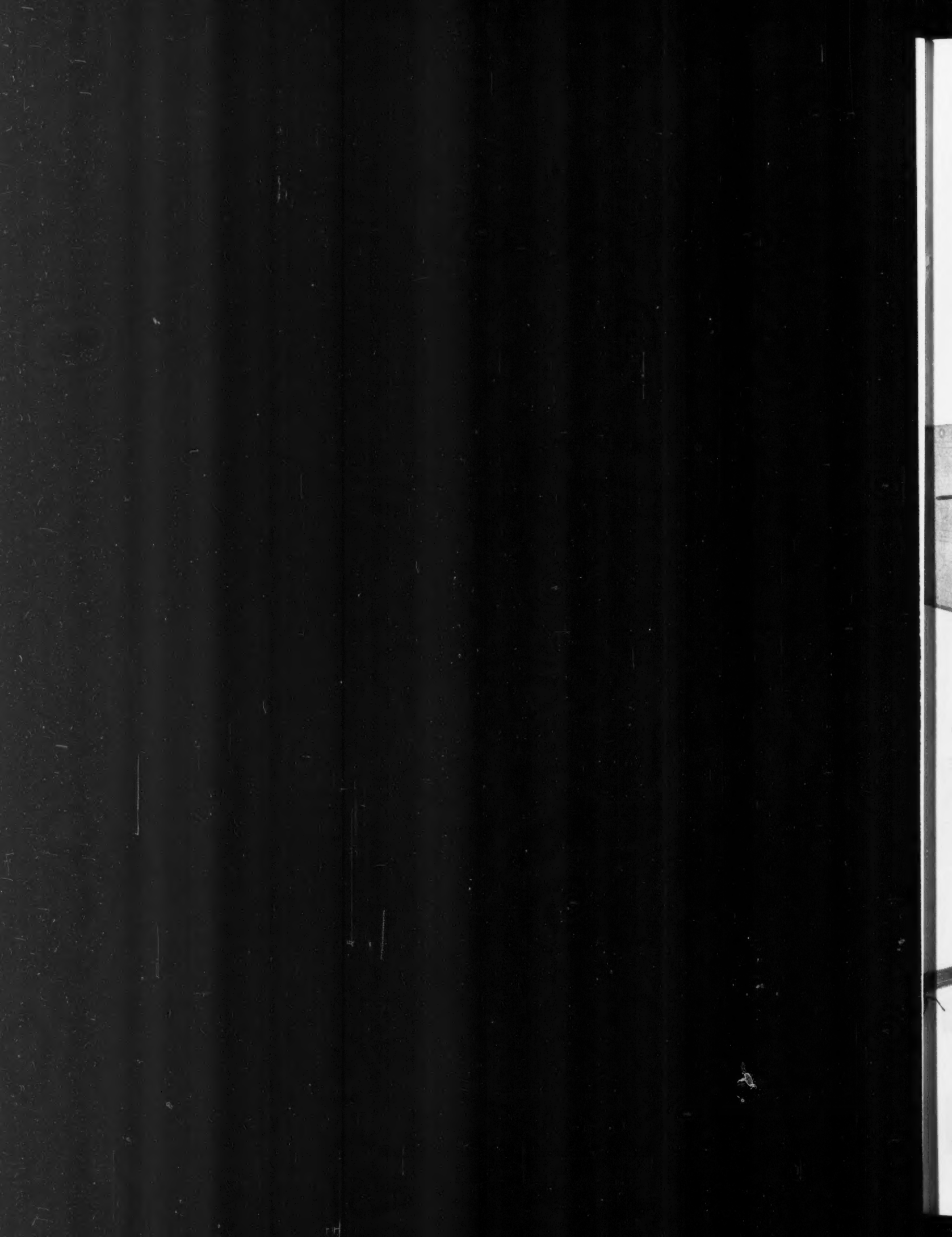
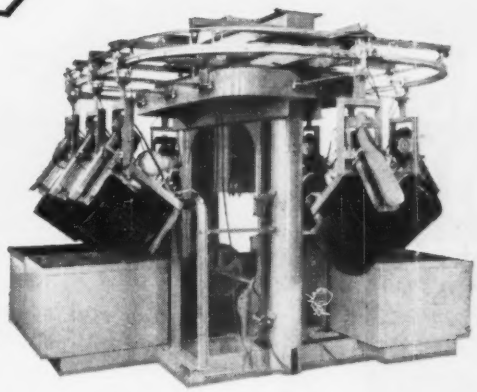
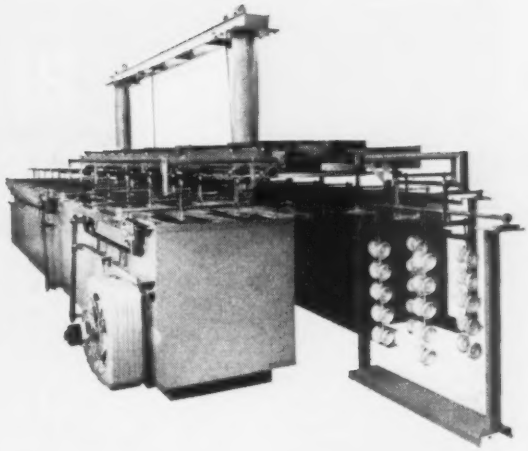
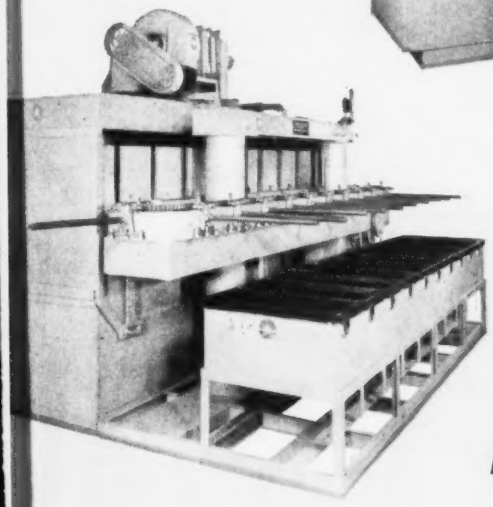


CROWN AUTOMATICS



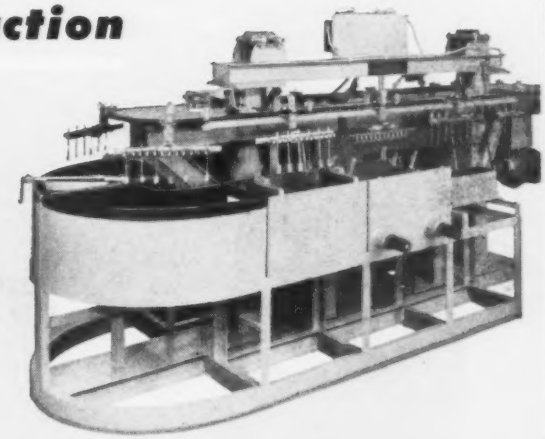


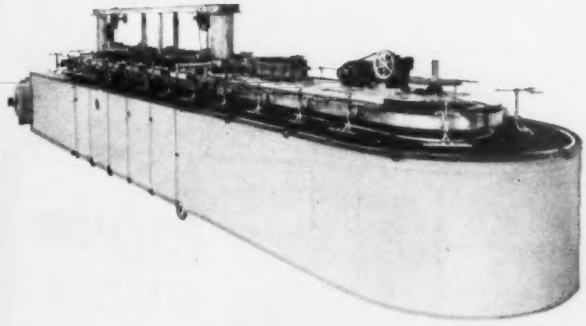


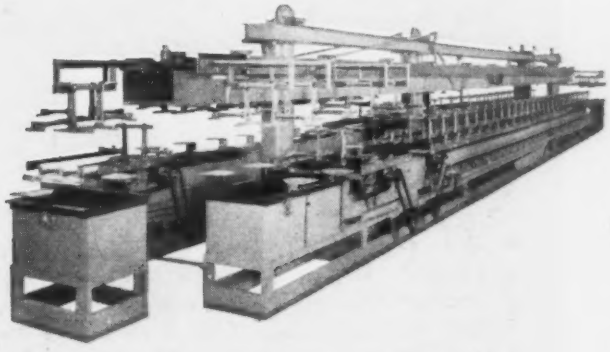
increase production

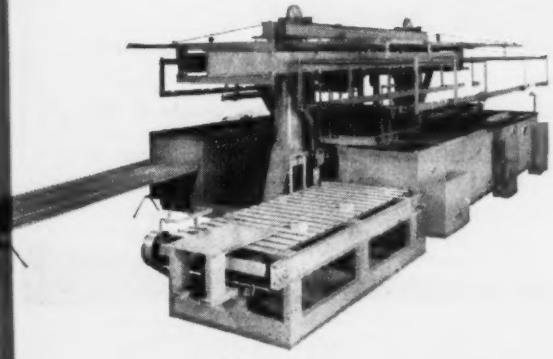
reduce costs

improve quality









Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry... *there is a model to fit your needs.* Write us details of your job and production requirements.

CROWN RHEOSTAT AND SUPPLY COMPANY

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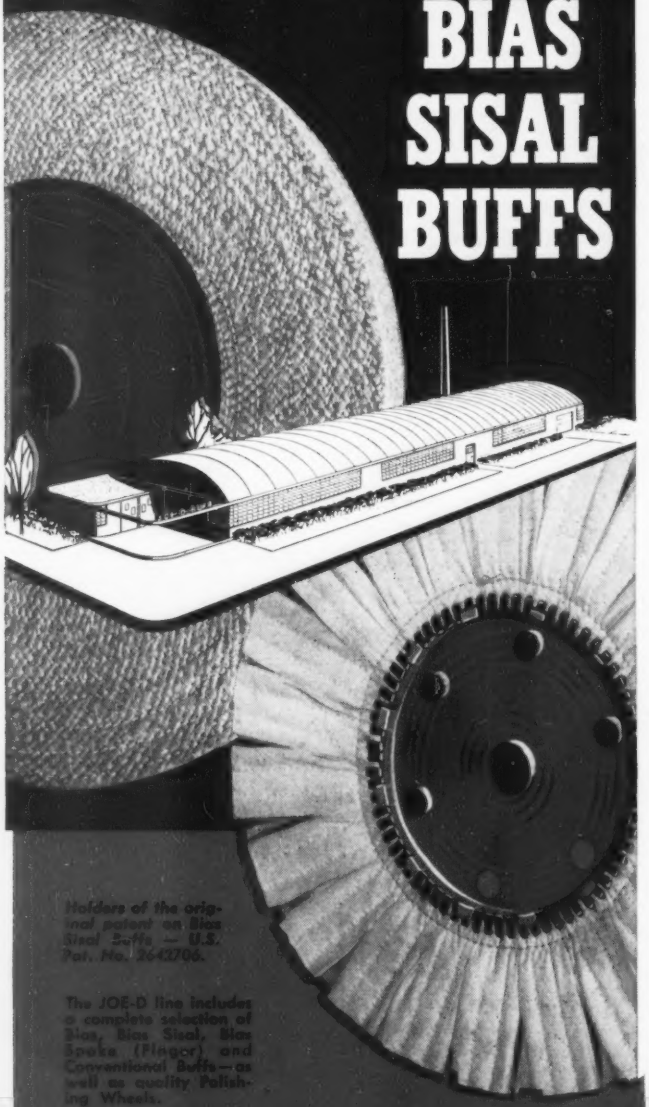
The "House that Sisal Built"

JOE-D ... Originators of BIAS SISAL BUFFS



Holders of the original patent on Bias Sisal Buffs — U.S. Pat. No. 2642706.

The JOE-D line includes a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

Since its founding, the JOE-D Buff Company has specialized in Sisal—constantly experimenting and testing ways to give you faster-cutting, longer-lasting Sisal Buffs. Made of the finest quality imported sisal, specially woven and processed for guaranteed fray-proof performance . . . never a loose end to whip or scratch . . . always an even nap to hold compound and provide better color. For every Sisal Buff requirement, specify JOE-D, the original—and still America's finest—Bias Sisal Buff!

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CHEMICALLY RESISTANT THROUGHOUT—Fabricated from *Iolyte* sheet properly reinforced. This is a structural material . . . not a lining.

Write for literature, prices, and table of chemical resistance for Iolyte tanks, crocks, ducts.

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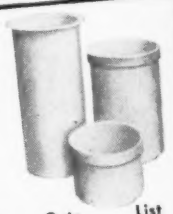

PRICE LIST

Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost	Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost
5	9"	18"	18.00	14	18"	12"	35.00
5	10"	15"	18.00	20	18"	18"	40.00
8	12"	16"	22.00	26	18"	24"	45.00
10	12"	20"	24.00	30	18"	28"	49.00
12	12"	24"	26.00	40	18"	36"	59.00
9	10"	24"	23.00	50	18"	48"	69.00
7	9"	24"	21.00	27	22"	18"	49.00
10	16"	12"	26.00	30	22"	20"	53.00
12	16"	14"	28.00	55	22"	36"	70.00
15	16"	18"	33.00	73	22"	48"	83.00
20	16"	24"	40.00	55	28"	22"	76.00
30	16"	36"	49.00	95	28"	36"	98.00
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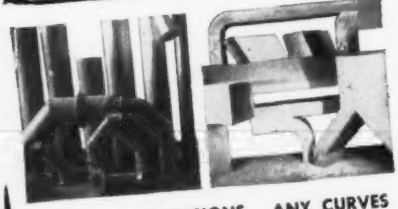

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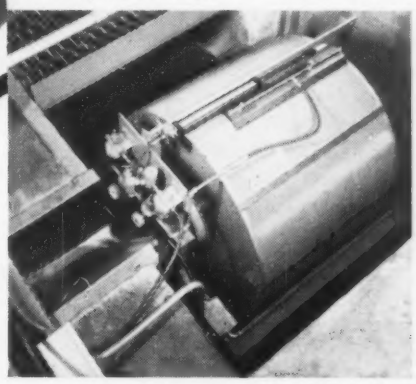

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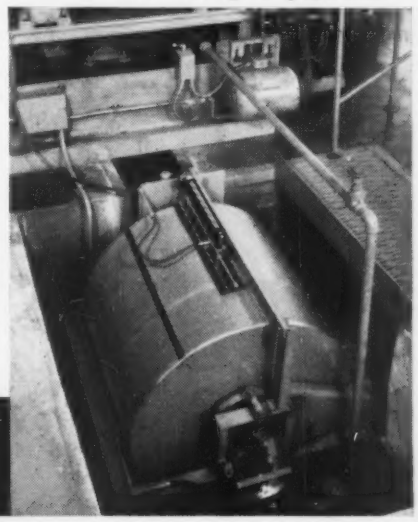

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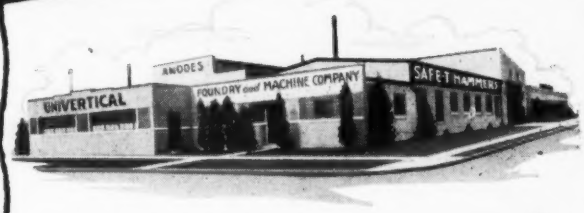

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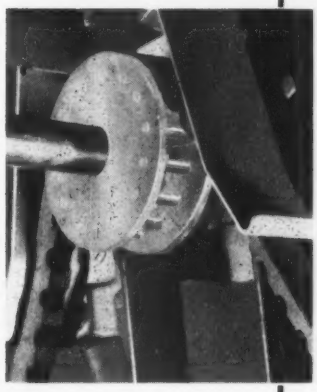

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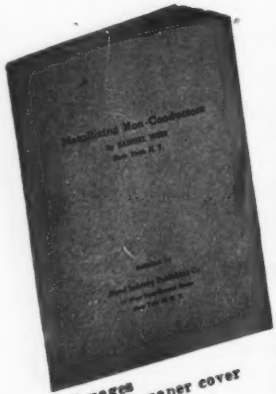

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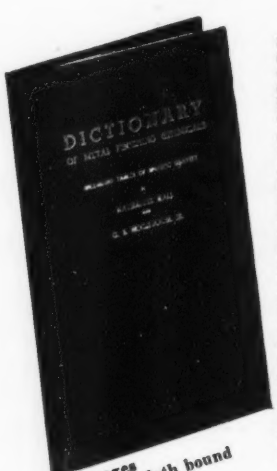

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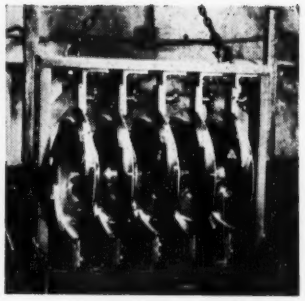

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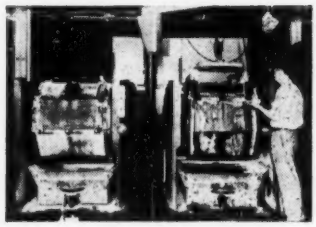

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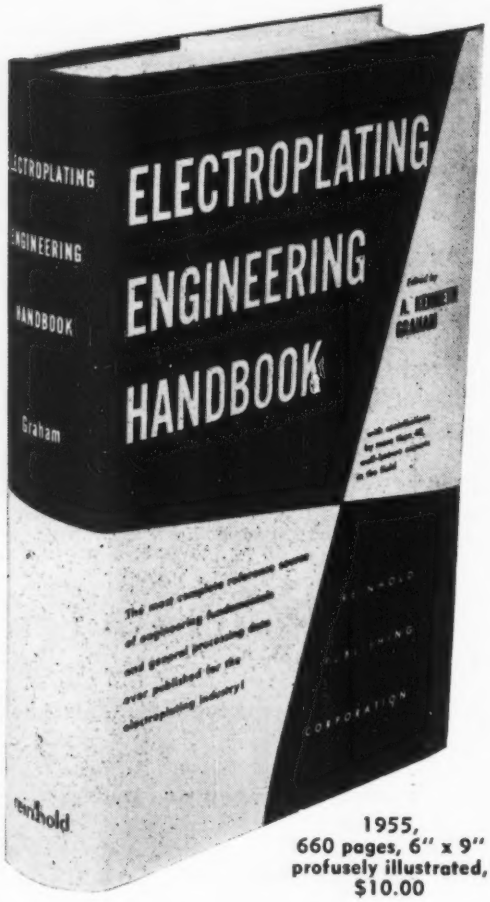

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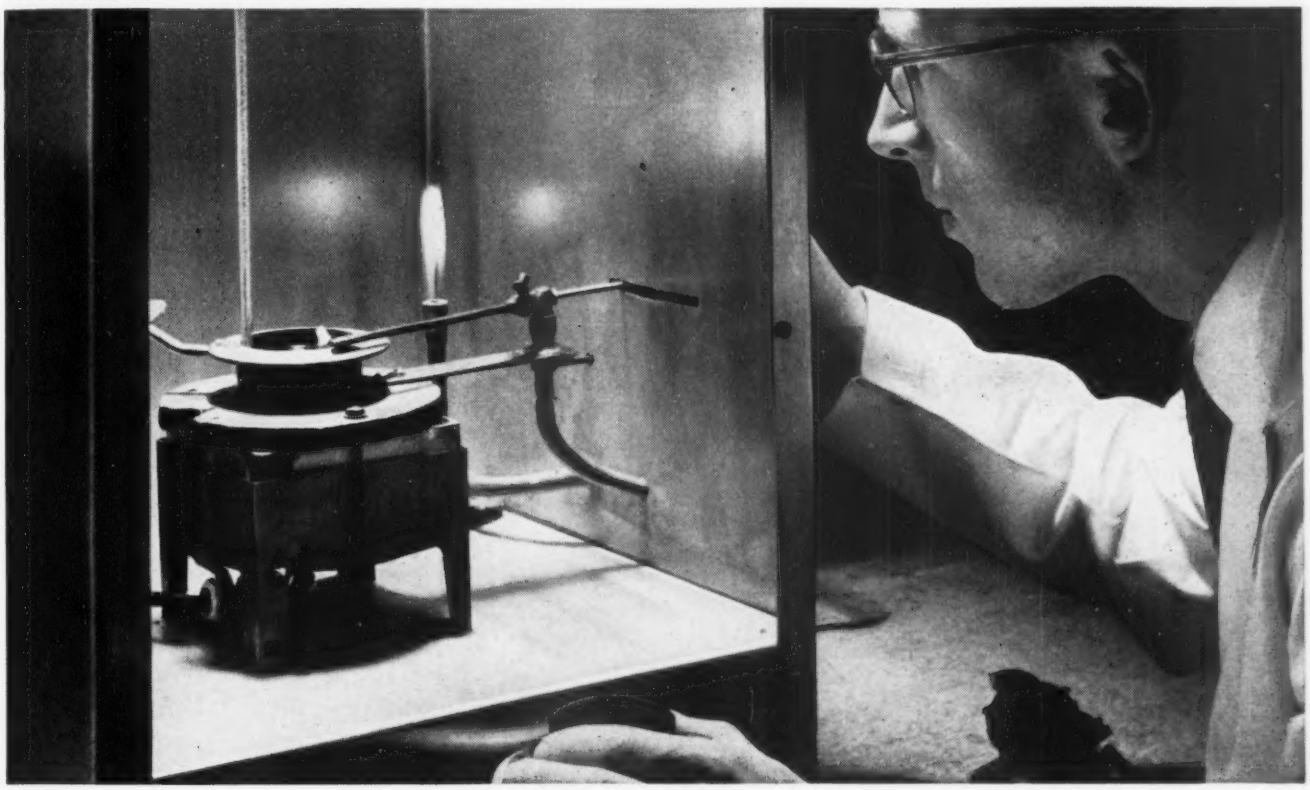

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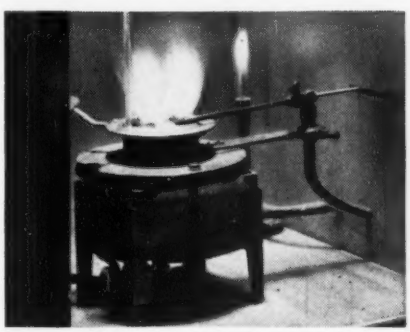

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METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

ESTABLISHED 1903 VOLUME 54 • NUMBER 7 • JULY, 1956

Metal Finishing Education

A few months ago, *Dr. Samuel Heiman*, who last month received the well deserved honor of election to the presidency of the *American Electroplaters' Society*, pointed out that educational facilities available to those working in the metal finishing industry are far inferior to those in Germany, not as good as in England, and even lag behind those available in this country a decade or more ago. His comments deserve consideration, as he has taught the course in metal finishing at Temple University's Technical Institute since 1950, and has been in closer contact with the subject of platers' education than most of us, in his capacity of National Education Chairman of the Society.

The industry has made such tremendous strides in the last twenty years that, technologically speaking, many formerly competent men are now considered insufficiently qualified to hold down some of the better paying positions. Yet, unwilling to recognize this situation or, possibly, due to false pride in some cases, they do not take advantage of the educational facilities presently available. On the other hand, newcomers to the field, often with a formal scientific education, feel that a course in electroplating will not be sufficiently rewarding to warrant surrender of their free evenings for a period of time. On the whole, however, existing courses are too well attended to permit drawing the conclusion that meager educational facilities are due to lack of interest.

Basically, the fault is that of management, in our opinion, in that there is widespread lack of recognition for the graduate of such courses. A journeyman printer, plumber, electrician, and carpenter are recognized as competent because they have served an apprenticeship and have completed certain courses of study. A prospective employer accepts them as qualified in their respective fields. In Germany and England, metal finishers are accepted on the same basis. Unfortunately, in this country an employer often will be unaware of the training available to a metal finisher and will place no confidence in a certificate showing a course has been completed.

It is up to all of us to convince employers that the job applicant, who has completed a course of study, has learned a great deal more about metal finishing than just how to analyze a plating solution. They must be taught to recognize membership in the A.E.S. as an indication of the ability of a man to accept new ideas and to keep abreast of developments. Once this obstacle has been hurdled, improvement in educational facilities must follow, in due course. Come to think of it, management needs to be educated, it would appear, rather than the metal finisher!

Nathaniel Hall

Ball Burnishing Fundamentals

By Arthur S. Kohler, *Frederick Gumm Chemical Co., Kearny, N. J.*

WHILE ball burnishing is a standard barrel finishing operation, it differs from deburring, grinding, honing, polishing, etc., in that there is no grinding action on the parts being processed. Furthermore, the medium used is a highly polished case-hardened steel ball or other shape, and the whole process is carried out in a lubricating solution. Since there is no grinding or chipping in the barrel, the only mechanical action produced is the flow of surface crystals of the metal being burnished. The general action might be likened to that of a road-roller which pushes down the surface irregularities and develops a smooth even surface.

Ball burnishing is used to produce a smooth mirror-like finish before plating with other metals, lacquering, etc. It is also used on plated surfaces, generally on the softer deposits such as silver, gold, brass, or copper to bring up a brilliant final luster and, in some cases, to close surface porosity for better corrosion resistance.

Mechanical Factors Effecting The Final Finish

METAL CHARACTERISTICS:

Since the operation concerns itself with the "flow" of surface crystals, the more malleable the metal, the easier it is to burnish it. Because of this, burnishing is not of much use where the metal grain structure is hard and rigid, as for example, carbon steel, hard nickel plate, and case-hardened steel. Furthermore, as the surface crystals work harden during the burnishing operation, the effect of burnishing decreases with the rolling time. As a result, the maximum burnishing action takes place at the start and diminishes with time since the surface crystals become less and less malleable due to surface hardening.

SURFACE CHARACTERISTICS:

The initial surface characteristics of the work has an important effect on the final finish obtained. If the surface initially is very rough, then it is quite possible that the amount of smoothing needed to develop a uniform, even surface will be so great that the surface will work harden before the job is completed. This is easily seen when deep drawn brass is burnished. Where heavy flow lines have developed during the drawing, the surface has a flat lifeless appearance, but the high points will be bright and shiny. Figure 1 should make the point clear. "a" is a reasonably smooth surface which readily burnishes to "b." "c" is a cross section of a surface where the roughness is excessive. This may burnish to "d", when the surface becomes so hardened that further burnishing will be ineffective. As a result, the surface instead of being mirror bright will have a "flat" unsatisfactory finish.

A similar effect is often seen on zinc base and aluminum die castings where the roughness due to "cold shots" is magnified by burnishing. Excessive surface pits will also cause "flatness" in the final burnished article. In general, the softer and more malleable metals may have greater initial roughness than the harder metals. Thus, while a soft copper surface can be initially quite dull and matte and still produce a high polish in burnishing, a harder metal such as steel requires a much smoother surface if a high burnish is to be produced.

Abrasive impregnation in the surface of the metal will interfere with burnishing. Such abrasive tends to produce a "flat" finish which is usually dark in color. All abrasive from previous deburring operations must be completely removed in the deburring barrel or with suitable chemical treatment before parts are put in the burnishing barrel.

Scale and tarnish on the work lead to discoloration of the work and loss of lustre. These should be removed prior to burnishing.

Where the surface is too rough, due to draw marks, parting lines, grind marks, it will often be found advisable to give the work a preliminary grinding operation in the deburring barrel to reduce the surface irregularities to the point where it is burnishable.

GEOMETRIC CHARACTERISTICS OF THE WORK:

The very shape of the work often has a marked bearing on the results obtained. In general, thicker

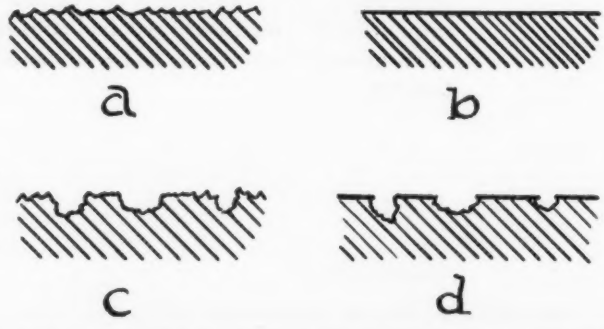

Figure 1. Showing the different results obtained from a relatively uniform surface and a rough surface (e.g. draw marks, cutting marks, etc.)

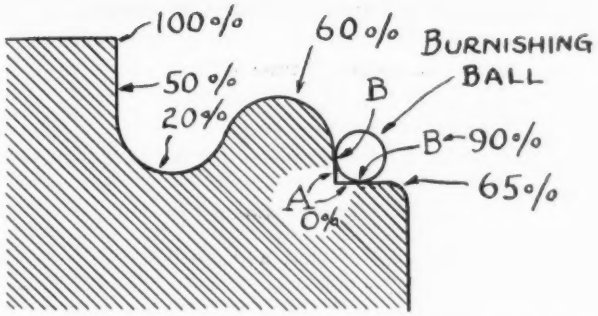

Figure 2. Showing the relative amount of burnishing action on a surface as affected by the shape of the surface.

stampings burnish more readily than thin stampings, even where the surface roughness, metal, hardness, etc., is the same in both cases. Possibly, this may be explained by the fact that the greater flexibility of the thin stock allows the metal to bend somewhat and spread the ball pressure over larger areas, thereby counteracting the normal unit surface pressure and reducing the burnishing action.

Burnishing does not take place uniformly except on uniform surfaces such as on flat, spherical or cylindrical shapes. Since most fabricated parts are not perfectly uniform, the burnishing action may show variations. So far, attempts to make comparative surface roughness or smoothness measurements on soft metals have not been successful with the profilometer since the sharp diamond point scratches the surface and gives erroneous results. However, a rough approximation of the effect on the shape is given in Figure 2. Points get the maximum action and outside edges are next in degree of burnishing. If the unit of action on an outside edge is 100%, then the other approximate values would be as marked in Figure 2.

If the shape shown in Figure 2 has a uniform matte finish before burnishing and is then burnished for a short time, it will be found that the edge marked 100% will be well polished, the flat areas will be about halfway between the original surface finish and the edge lustre. Concave surfaces will be less polished depending on the radius of curvature, etc. The area indicated by "A" will be unaffected, but the points of contact "B", where the ball rides, will be nearly as bright as the edge. These bright lines adjacent to the dull area are called "ball races", and the burnishing action which would normally be applied to the entire corner area concentrates on the two lines of contact shown. Sharp inside corners should be avoided in the design of the part whenever possible. The ball race effect can be overcome to some extent by using different burnishing shapes (see below).

The effect of draw marks, cutting tool lines (in screw machine parts), parting lines, etc., have been discussed above.

In view of the fact that recessed areas get less burnishing action than the more prominent surfaces, the burnishing time is increased until these surfaces are brought to the desired degree of lustre.

Burnishing Barrels

Barrels should be of the horizontal type and may be either closed barrels or the tubbing (submerged) type.

For small parts, the latter type is often preferred since loading and unloading is simple and the same batch of burnishing compound can be used for a number of runs. The tubbing barrel has been a favorite in the jewelry industry is often called a "jeweler's barrel." Usually, these barrels are about 12 to 15 inches I.D. across-the-flats measurement and operate at speeds of 25 to 45 r.p.m.

The closed-type of barrel is preferred for larger work and larger loads. This type uses a fresh charge of compound and water for each load. These barrels can be unlined steel or stainless steel, or lined with wood, Neoprene, polyvinyl chloride, synthetic rubber, etc. Wood linings were used exclusively for many years and, for many operators, it is still the most popular. A wood lining will often last for 3 to 5 years and give excellent results; however, where the work pieces are sharp and somewhat heavy, wood linings may wear away in a few months. End cut wood has better wear resistance than wood cut with the grain. Some operators have experienced trouble with Neoprene and rubber linings, due to a blackish smudge being deposited on the work. Often this trouble disappears after the barrel has been used for a month or two. It is probably due to overcuring of the surface during vulcanization. Tumbling the barrel with an abrasive medium and burnishing compound for a day or two will often remove this surface condition from the lining.

Closed type barrels may range from about 12 inches to 30 inches or more in diameter. Barrel speeds may vary from 35-40 r.p.m. for the small barrels to 18-22 r.p.m. for the larger diameter barrels.

In general, the barrel speed should be kept below the point where the parts are damaged by collision. The larger and heavier work requires slower barrel speeds than small light pieces. No definite rule can be given as to speed of barrel operation, since often the optimum conditions must be found by experiment.

Oblique barrels are, as a rule, unsatisfactory, for ball burnishing, since the load separates into zones or layers. Occasionally one finds this type used for short burnishing operations, and in special cases where the shot and work load are reasonably compatible, but such cases are a rarity, and the attempted use of this type of equipment, in most cases, results in failure and poor results.

Burnishing Shot

Figure 3 shows different types of shot used in burnishing. The ball is to be preferred exclusively whenever possible; however, due to recessed areas, channels, etc., it is sometimes necessary to use some of the other shapes. When this is necessary, a mixed load is

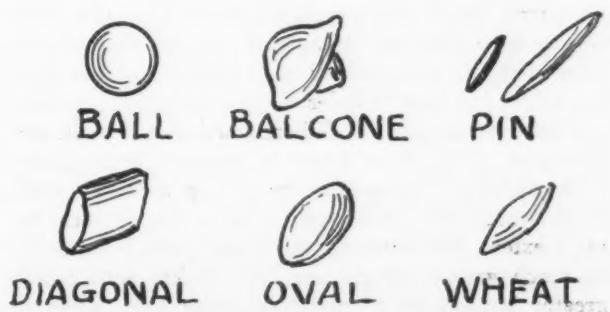

Figure 3. Showing various types of burnishing shot.

preferable to using the non-spherical shapes alone. The ball, since it is free of edges and points, has less tendency to damage the surface. Shapes such as diagonals, balcones, etc., when used alone cause "orange-peel" surface. Where such shapes are necessary, a mixed load such as 75-90% balls and 25-10% "shapes" will be found preferable.

The burnishing shot is formed of soft steel, which is ground to a smooth surface, case hardened, and finally polished to a high lustre. As purchased, the shot is coated with a protective oil coating and carefully packed to avoid rusting; however, much shot after a short time of use becomes rusted, rough, and pitted. There is no need for this to occur if reasonable care is taken, since well-cared for shot may be used for many years. Rarely is the shot damaged in use. It is generally while the shot is not in use that the damage occurs. The principle trouble comes from the shot being exposed to air and water simultaneously. If burnishing balls are kept completely covered with water and burnishing compound for a day or two the shot will not be damaged, but, when the solution is allowed to evaporate so that some of the balls are exposed to air, it will be found that rust rapidly starts to form. Where shot has to be stored for more than a few days, it is preferable to keep it stored in a drum completely covered with a strong alkaline cleaner at 1-2 oz./gal. concentration. A cover on the drum will prevent evaporation of the water and consequent exposure of the shot to the air. Shot can be stored in this way for prolonged periods of time. Where storage in bins or boxes is necessary, a recommended practice is to rinse the balls in clean water and then dip them in a water-displacing rust preventative oil.

Burnishing shot comes in different sizes and ranging in the case of balls from $\frac{3}{32}$" to about $\frac{3}{8}$" in diameter. The use of certain sizes is sometimes necessary where the work has holes or slots in it. When possible, oversize shot is preferred or else a size small enough to pass easily through the holes so that the holes do not become plugged.

Two effects are to be considered in choosing shot. First the small size shot is gentle in action and a longer burnishing time is required than is the case with larger shot. Larger size shot is more vigorous in action and is often necessary on the harder metals, whereas, the smaller sizes will often be well suited to the softer metals.

The second effect is the matter of fluidity, or rigidity, of a mass of burnishing shot and work. Small shot flows quite readily and has a fluid nature. The larger size shot forms a more rigid structure. As the barrel turns and the shot slides down to the opposite side of the barrel, some of the work protrudes from the non-sliding zone into the sliding zone. In the case of the large shot, the work is held quite rigidly and the sliding work and shot collides with considerable impact against protruding work. Where small shot is used, the damaging effect of collisions is lessened because the work pieces extending into the sliding zone can shift in the more fluid mass and cushion the impacts to some extent. Furthermore, the larger shot, because of its much greater weight per ball, strikes with much greater impact. As a result, the large shot, while it burnishes more rapidly, also tends to damage the work to a greater extent than small shot. Consequently, the problem is to choose a shot which is large enough to burnish in a minimum of time without excessive damage to the parts. The author suggests that the $\frac{5}{32}$" ball is a good general purpose size for the softer metals, and the $\frac{3}{16}$" or $\frac{1}{4}$" size is better for the harder metals.

Barrel Load

Usually, the load of shot and work varies between 40 and 60% of the total barrel capacity. The lower figure is often used in jeweler barrels, but 50-60% is preferred in the larger barrels.

Often considerable damage to the work occurs during the loading operation and during the unloading and separation of the work and shot. A little care and forethought in connection with these steps may often prevent damage to the work.

One of the most common causes of nicked, damaged work is overloading the barrel with work. It is natural, of course, for the production man to want as large a pay load as possible, but this desire has to be curbed if quality results are desired. It should be remembered that the purpose of the burnishing shot is two-fold, namely, to rub and press against the surface of the work, thus smoothing the irregularities, and also to keep the work pieces separated from each other, thereby preventing parts colliding together and being bruised. Obviously, if the parts are to be kept separate, there must be a sufficient volume of shot so that each piece can be completely surrounded by the medium. As a rule, small light parts require less cushioning action and a lower ratio of shot to work can be used. Larger pieces require a high ratio of shot to work. Shot to work ratios are based on volumes of material stacked at random. Thus, if a ratio of 4:1 is recommended, this means that 4 unit volumes of shot to 1 volume of work is best for the job from the standpoint of maximum output with minimum damage to the work. For small pieces (of a major dimension approximately up to 1 inch) a 3:1 ratio will often be satisfactory and larger work will require higher ratios, up to 8:1, or even 10:1 in some cases.

Where parts are large and fragile, the work may be held loosely on jigs. If the work is rectangular (e.g., handbag frames) a number of rods may be fastened crosswise of the barrel and a number of parts placed loosely on the rods. The parts are free to move in a limited portion of the barrel but do not collide or snarl. The cover generally engages the open ends of the rods and locks the frames in place. When parts are held on fixtures, it is generally necessary to change the direction of rotation of the barrel half way through the operation, so that all sides get an equal amount of action. Where large and expensive parts are to be given a final burnishing operation, a multi-compartment barrel may be advantageous to use. Here one piece of work would be treated in each compartment. This procedure eliminates the danger of nicking.

Chemical Factors Affecting The Final Finish

While the factors discussed influence the mechanical part of burnishing, the final brilliance and cleanness of color are determined by the chemical conditions

which exist in the barrel and treatment of the work before burnishing.

CLEANLINESS:

For best results, the work should be cleaned free of all oil, dirt, grease, and abrasive materials. In general, the work should be as clean as before a plating operation. In some cases, degreasing can be used to remove oils but, in most cases, a thorough hot alkaline soak cleaning operation in baskets is best. After alkaline cleaning, the work should be well rinsed in clean water and given a mild descaling treatment to remove surface oxides, tarnish, or rust. This latter treatment is usually of short duration (10-30 seconds). The work should then be thoroughly rinsed as rapidly as possible in good clean running water. It is important that all chemicals be rinsed away so as not to contaminate the burnishing compound in the barrel.

Work which has been deburred should be freed of abrasive in the deburring barrel by tumble-flushing the parts thoroughly until the rinse water is free of all abrasive and soil. After removal from the deburring barrel, the parts may be cleaned as described above.

Parts which have been plated should be well rinsed in clean water and, in some cases, given a mild acid dip to neutralize the plating chemicals and to prevent staining. After the acid dip and thorough rinsing, the work is ready for the burnishing barrel without further cleaning. Some operators use the nitric-sulfuric bright dips on brass and copper before burnishing. This is a dangerous practice and should be avoided whenever possible, since it enlarges surface pores and pits, and tends to develop an orange-peel surface which the burnishing barrel may not be able to completely eliminate. Unless the parts have recesses or filigree which cannot be reached by the burnishing shot, it is better to use a mild acid-chromate type of dip. Where a bright dip is absolutely necessary, the nitric-phosphoric-acetic acid bright dip is to be preferred since this does not enlarge pores and tends rather to smooth the surface.

BURNISHING COMPOUND:

The original material generally used for ball burnishing was ordinary 42 titre soap; however, today, proprietary burnishing compounds are preferred by most operators. The burnishing compound's principal function is to lubricate the surface and thereby prevent grinding action between the pieces in the barrel. It further prevents any dirt or oil which has not been completely removed in the pre-burnishing treatment from depositing on the work. It provides a mildly alkaline solution which protects the steel shot from rusting and, in some cases at least, it prevents the work from tarnishing. Most compounds today contain regular or synthetic soaps, water conditioners, chemicals to buffer the solution chemically to maintain a desired pH, and may also contain tarnish inhibitors, lubricants, tarnish removers, etc.

Often a compound which gives excellent results on one metal may not be the best for another metal. As a result, where a variety of materials are to be burnished, it may be necessary to use several different compounds for best results. It is well to check with the supplier before using the compound on an unfamiliar metal. It is also advisable to use the compound at the concentration recommended by the supplier. Excessive amounts of compound may have disastrous results.

Usually, the burnishing compound is used at a concentration of approximately one ounce per gallon of water. As plating room chemical solutions go, this is an unusually dilute solution. Plating solutions may have total concentrations of 5 to 50 ounces per gallon; cleaners 4 to 12 ounces, and acids 10-100 ounces per gallon. Obviously, small amounts of these concentrated solutions dragged into the burnishing barrel could easily upset the burnishing conditions. So it is very important that the parts be thoroughly rinsed before being introduced into the barrel.

RINSING AND DRYING:

After burnishing, the parts should be removed from the barrel immediately, separated, rinsed, and dried. If parts are left standing in the barrel for any considerable period before separation, there is a good possibility of tarnishing or rusting occurring. Usually, the tarnish is not uniform but has a "freckled" or spotted appearance. This requires that the work go through the pre-burnishing cleaning again and that the work be burnished a second time. If the work is separated from the shot and allowed to stand for any length of time while wet, either with compound or water on it, there is a good likelihood that tarnish, water staining and spotting will be produced. It is strongly recommended that the work be separated, rinsed, and dried rapidly to prevent spoiling the clean, brilliant color produced in the barrel. The drying may be done centrifugally or with clean hot sawdust in a tumbling barrel or a sieve.

If burnished parts are to be plated immediately after burnishing, the work should be separated and rinsed well. In most cases, the metal will develop water-breaks at this point and must be cleaned in baskets to remove the soap film left after burnishing. A mild alkaline soak cleaner readily removes this residue in a minute or two. The work can now be rinsed, acid or cyanide dipped, rinsed, and transferred to the plating barrel.

Surface Treatment and Finishing of Light Metals

IX. Coloring Anodic Coatings

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M., and R. Pinner, B.Sc.

AFTER anodic oxidation by the sulphuric acid and oxalic acid processes and, to a lesser extent, by the chromic acid process, the metal is left with a porous film which is strongly absorbent and which will readily stain in contact with oils, greases or any coloring matter. This coating consists mainly of amorphous alumina with or without a small amount of γ-Al_2O_3, while on the pore surfaces some of the hydrate $Al_2O_3 \cdot H_2O$ will have been formed. In the sulphuric and oxalic processes, the coating does not achieve the maximum protection against corrosion until it has been made non-absorbent by a sealing treatment in which the anhydrous Al_2O_3 is converted into the hydrate which, due to its lower specific gravity, has a larger volume and, by expanding, seals off the pore spaces. The methods employed to seal coatings will be dealt with after consideration of the coloring and dyeing of anodic oxide films. Both natural and dyed coatings are normally sealed, in the latter case in order to prevent leaching of the dye, to improve light fastness and, in general, to improve the corrosion resistance of the coating. Where the film is not to be colored it will, of course, be sealed directly after anodizing.

The main requirements of anodic films that are to be dyed are: (1) that the coating is of adequate thickness. The precise thickness required varies with the shade to be dyed, i.e., dark color tones will require thicker coatings; (2) that it will be sufficiently porous and absorptive; (3) that the coating will itself have a suitable color; and (4) that it will be free from blemishes due to scratches, large pores, pits, etc., and from differences in metallurgical structure, i.e., grain size, etc., to segregation. In decorative color-anodizing it is therefore essential to use good quality metal and most manufacturing firms supply an "anodizing quality" material. The choice of the anodizing process to be used will vary with the particular work to be treated but, in addition to the factors considered in earlier chapters, special attention must be given to (a) the thickness and porosity of the coating and (b) its color.

In general, the most suitable process is the d.c. sulphuric acid process which, on aluminum and most alloys, is colorless and transparent. The normal d.c. oxalic acid process (GX) produces a yellow coating and for dyeing, the modified process (GXh) is preferable. The latter is operated at 35°C. and produces very light-colored films. The oxalic acid process is, however, more expensive than sulphuric acid and is used generally where either thick coatings (above 50 μ) are required, where other specific properties of the oxalic acid film are required, or where the natural yellow or bronze colors obtainable by the process are desired. The Bengough-Stuart chromic acid coating is less suitable for coloring due to its thinness and smaller porosity in addition to which its grey color makes it suitable only for darker shades. Satisfactory dyed chromic acid coatings have, however, been obtained by the use of modified treatments. Many other coatings may also be dyed, such as the opaque Ematal coatings, etc.

Coloring With Organic Dyes

Many types of organic dyes are in use, including both the acid and basic types. Alizarine dyes, complex metallic dyes, indigo dyes and even cotton dyes, diazo dyes, etc., are employed. The color obtained is a function of the alumina film and the degree of dispersion of the dye. Dyestuffs employed must be absorbed deep down into the coating and they must, of course, be light-fast, though the light fastness obtained will depend also on the alloy used, the type and method of production of the coating, and the sealing operation subsequent to dyeing. The absorption depends largely on the pH of the dye solution.

As has been described, the aim in anodizing before coloring is to produce thick and porous coatings as the color intensity depends on the amount of dye taken up by the coating. Thus, in sulphuric and oxalic acid processes, the current density and time are increased as well as the temperature up to the limits allowed by the conditions affecting limiting film thickness. The thickness varies with the color intensity. Thus, Schenk[1] gives the operating times with d.c. sulphuric acid at 15 amp./sq. ft. and at 25° to 28°C., as 25 to 30 minutes anodizing time for light to medium colors, 30 to 40 minutes for dark colors, and 40 to 45 minutes for black.

After anodizing, the aluminum is rinsed thoroughly

in running water, neutralized in a weak solution of ammonia or sodium carbonate and rinsed again before immersing in the dye bath. If the work is to be stored between anodizing and dyeing, this can be done as long as finger-marking is avoided and no water drops are left on the anodized aluminum which might give stains on the anodic film. However, dyeing should not be postponed too long as prolonged storage will decrease the absorptive power of the coating.

A process described by Durand and Huguenin A.G.[2] is of some interest in that it is claimed to increase the affinity of the aluminum oxide coating to dyes. This process, which is carried out either directly after anodizing or, where the parts are stored, before the work is transferred to the dye bath, comprises immersion in a solution containing 5 cc./l. sulphuric acid either at 80°C. for one minute or at 40°C. for 15 minutes. Alternatively, a 50 cc./l. sulphuric acid solution may be used at room temperature for 30 to 60 minutes. By this means it is stated to be possible to reduce the concentration of the dye bath and to effect economies of up to 80%. In addition, it is possible to obtain stronger shades with some black, green, and red dyes. The acid treatment should not, however, be carried out in more concentrated solution or prolonged unduly, as this may effect the reflectivity and hardness of the surface.

The normal organic dye bath is operated hot, usually between 65° and 70°C., though in some cases up to boiling temperature may be used. The temperature is fairly critical. Bad dyeing results if the temperature is too low; if it is too high, there is a danger of sealing occurring before sufficient dye is absorbed. Preferably, therefore, the bath should be thermostatically controlled.

Dyeing is carried out in earthenware, enamel, Monel, stainless steel, wood, glass or rubber-lined tanks fitted with agitation and filtration. They are preferably covered when not in use.

The time of dyeing is important. If this is too short, the color is not light-fast, though too long times do not usually matter unless further dyeing stages are to follow. Concentration of the dye-bath varies with the dye used but increases with the color intensity required. Thus Schenk quotes:

Very light tones	0.1 to 0.3 g./l.
Light tones	1 "
Dark tones	5 "
Black tones	10 "

Very heavy shades such as black may require concentrations up to 10 g./l. The dye must be completely soluble in the solution which is usually a neutral or acid aqueous solution, less often an alcoholic or acetone solution, and the pH is checked regularly. Care must be taken to keep the dye-bath free from heavy metals, e.g., copper or lead, and particularly also from oil and grease which might enter through unwashed air used in agitation, as oils and grease are readily absorbed by the coating where they produce stains.

Mixtures of dyes may be employed but care must be taken in their use as selective absorption may take place in the dye bath with the result that patchy deposits may be formed or the color may change during the working of the bath. In general, it is recommended to obtain the appropriate single dyestuff from a reputable manufacturer. It must also be remembered that mixtures of dyes may have light-fastness inferior to the individual component.

Various additions have been proposed to the bath to improve dyeing or the light-fastness of the dye, e.g., sugar,[3] ferric hydroxide,[4] etc. Light-fastness may be tested by fadeometer, by putting the specimen under glass and comparing the color after intervals with standard colors. Weather fastness is similarly tested by exposure to sun and rain.

Unless dye baths are made up fresh each day, it is necessary to use distilled or soft water, as hard water may form precipitates. This may also be avoided by adding up to 5 per cent of hexametaphosphate. The dye must also be completely dissolved; it should be mixed into a paste with a little water, then put into solution with hot water and finally diluted to the required volume. Flecked work may be obtained if the dye is not properly dissolved.

Dyes used in acid solution are normally dissolved in 0.03 per cent acetic acid.

Cold Dye Baths:

Anodized work that has been treated by the chromic acid, or preferably by the d.c. sulphuric acid process, may also be dyed in cold dye baths which facilitate control. The dyeing solution is a little more concentrated, i.e., 0.5 to 10 g./l. for colors and higher for black coatings, and the solution is worked with agitation at room temperature for ½ to 2 minutes for pastel shades and up to 15 minutes for stronger colors. After dyeing, the work is rinsed and suspended in steam for 15 minutes, which seals the coating. Subsequently the work is again rinsed and dried.

The dyeing time will again vary with the dye used and the shade wanted. Up to 15 minutes is normal for full shades while, at the other end of the scale, ½-2 minutes immersion may be used for very weak shades. In this case there is some drop in light- and weather-fastness as the dye does not penetrate deeply into the coating.

The acid treatment described above is also stated to facilitate cold dyeing. In this case it is possible to work at 15°-20°C. using the normal concentration of the dyes.

Faults in Dyeing:

Apart from the need to control the anodizing technique and for proper choice of anodizing process and metal or alloy, the following rules should be observed. No electrolyte should remain in cracks, recesses, etc. This applies especially to the chromic acid process which is frequently used on recessed work, as chromic acid will stain the dyed coating. Throwing power has to be taken into account in deeply-recessed work, especially in the sulphuric acid process as, although the throwing power is excellent compared with electrodeposition, even slight differences in coating thickness (below approximately 30 μ) may alter the color intensity on dyeing. Welds give trouble in dyeing due to their different structure and composition, due to heat treatment, etc. In dyeing blacks, special care is needed to obtain satisfactory coating thickness and porosity, and

the work should be adequately polished before anodizing, as rough spots tend to lack lustre or may even appear grey. Under careful control, however, it has been possible to obtain satisfactory black dyeing even on a 12 per cent silicon alloy.[3]

Bleeding During Sealing:

If bleeding of the dye is experienced during the sealing treatment, the proper care for this is to control the pH. However, the following treatments may help.

1. Immersing the dyed work into boiling water for 20 seconds and plunging quickly into cold water. This is followed by the normal sealing method.
2. The dyed work is immersed in a 20% barium chloride solution for 5 minutes at 45°C. before sealing.

Removing the Dye:

If it has been found after dyeing and previous to sealing that the desired shade has not been obtained, it is often possible to remove the dyestuff either completely or partially without damage to the anodic oxide coating. This is carried out either in nitric acid or in 5 ml./l. sulphuric acid at 25°C. Some dyes may, however, be unstrippable and these include particularly some dark yellows and golds, while in other cases more concentrated sulphuric acid may be necessary.

Many dyes may be bleached by immersing in cold 1% sodium hypochorite solution for a few minutes.

Removal of the dye is only satisfactory, however, where the coating has not been sealed.

Azo and Basic Dyes:

Apart from the dyes mentioned, recent developments have also included the use of azo dyes[5] which are water insoluble and are formed in the film itself. Their insolubility results in superior water resistance and lightfastness and there is no need to seal the coating to prevent leaching. The dye is produced by diazotization of the primary amine in ice-cooled water by means of a hydrochloric acid solution of sodium nitrite, and subsequent reaction with alkaline β-naphthol or δ-naphthylamine, etc.

Sometimes anodic coatings may also be dyed by means of basic dyes[6] such as Rhodamine B, Safranine T, Auramine, Chrysoidine R and Brilliant Green B, but these must be mordanted in a cold solution of, for example, 5 per cent potassium antimonyl tartrate or 2 per cent sodium silicate for 10 minutes, or in tartaric acid solution.

Black Dyeing:

As stated, special care must be taken with black colors both in the preceding anodic treatment and in the dyeing process. Thus, an interesting process developed by the Aluminum Company of America is described by Herwig[7] which illustrates some of the difficulties. The d.c. sulphuric acid coatings which were to be dyed were produced in a 15 to 25%/vol. H_2SO_4 solution at 67° to 88°F. at 2 to 18 amp. per sq. ft. for 15 to 90 minutes and were then dyed for 10 to 30 minutes at 40° to 160°F. in the black dye bath, with subsequent sealing in hot water or nickel acetate solution. Since the surface area was difficult to measure, it was found more satisfactory to control the voltage rather than the current and, according to experience, the voltage necessary to produce 12 amp. per sq. ft. was found to be 9 to 21 volts, depending on the alloy, temperature and concentration. Frequently, with the use of different alloys, different temperatures had to be maintained, necessitating both heating and cooling equipment unless two separate tanks were employed. Many plants, however, preferred to work independent of alloy composition at the normal conditions of 15 to 18 per cent H_2SO_4, 78°F. and 12 amp. per sq. ft. for 45 minutes, and fairly good black colors could be obtained with Nigrosine crystals, though temperature was found to be critical to 1 to 2 deg. F. The time, too, was critical, an excess of 5 minutes causing a sooty black deposit on Al-Cu alloys.

Experiments were carried out to simplify the technique of anodizing and dyeing, using 25, 18 and 13 per cent sulphuric acid solutions, temperatures of 70° to 90°F., current densities from 10 to 18 amp. per sq. ft. and times from 15 to 75 minutes. Dyeing baths containing Nigrosine and Nigrosine-Metanil Yellow mixture were investigated at pH 4 to 7 and 140° to 160°F. with subsequent hot water sealing. The corrosion resistance and hardness of the coating, as well as depth of dye penetration, were tested in each case, and the best anodizing conditions were found to be 60 minutes at 70° to 75°F. and 10 amp. per sq. ft. in the 13 per cent sulphuric acid bath. The best dye bath contained 1.608 oz. per gal. Nigrosine and 0.268 oz. per gal. Metanil Yellow at 160°F. and pH 4.5 to 4.8. It was also found that, in the spectrophotometer, a solution containing both dyestuffs would absorb 20 per cent more light at wavelength 745 μ than one containing only Nigrosine.

Darrin and Tubb's experiments[3] with chromic acid coatings are also of interest here. These authors worked with the rapid chromic acid solution (5 to 10 per cent CrO_3) at 40 volts and found that satisfactory black colors could be obtained by dyeing provided the temperature was kept high and the time increased to obtain sufficient coating thickness, though not so high as to obtain powdery or uneven coatings.

The best results were obtained at 90 to 120 minutes at 40 volts with 5 to 10 per cent CrO_3 solutions at 52°C., while reasonably good results were obtained even at 60 minutes. The time must not, however, exceed 2 hours. The voltage had little effect below 40 volts; above this, a bluish tinge was observed. The most intense black was obtained when the pH of the CrO_3 solution was 0.41. The results are summarized in Table I.

The most satisfactory dye was found to be a 5 per cent solution of Nigrosine JB at pH 7 to 8 and 180°C. for 30 minutes, with subsequent hot water sealing. Alloys that were dyed satisfactorily included the Al-Mn alloy 3S, a Duralumin-type alloy, and an Al-Mg-Cr alloy (2.5 per cent Mg, 0.25 per cent Cr). A reasonable black was obtained even on a high Al-Si alloy by the use of a shorter anodizing time and lower temperature. Good results were obtained on deepdrawn 2S and 3S, stamped and forged 17S. Higher gloss was, of course, obtained on polished metal.

TABLE I

Black Dyeing of Rapid Chromic Acid-Process Coatings[3]

Time of Anodizing (minutes)	*Color Produced on Black Dyeing*
30	Transparent grey
60	Dark grey
90	Glossy black
120	Deep glossy black
180	Deep glossy black
240	Deep black, less glossy
990	Dull, uneven black

An interesting point was that the bluish tinge obtained at high voltages and low pH could be masked by the addition of 15 to 20 per cent (with respect to Nigrosine JB) of Metanil Yellow.

Another modification of the chromic acid process which facilitates dyeing, is that of Siemens and Halske[8] who obtained bright, almost white and very porous films, especially suitable for photographic processes, in 20 per cent chromic acid at above 40°C. using as low as 20 volts at 65°C. for 30 minutes.

LIGHT-FASTNESS:

The light-fastness of dyed coatings is not an absolute physical property and the quantitative values, given from No. 1 to No. 8, express a comparison with standard patterns. One test for determining the light-fastness of a dyed finish[9] is by means of comparison with cloths dyed in standard colors of known relative light-fastness which are exposed to daylight or to an artificial light source side by side with the anodized finish. The samples, covered with glass and half of which are masked, are exposed for long enough to cause fading of either the aluminum or the standard pattern No. 8 and are subsequently compared by daylight and given the light-fastness number of the pattern that has faded to the same extent. In uncertain or border-line cases, a standard illuminant[10] may be used.[11,12] The temperature of the samples undergoing the test should not exceed 150°F. and, where artificial light is employed, the samples should be rotated round the light source. The British Standard prescribes light-fastness of at least No. 3 for finishes for indoor exposure conditions and No. 7 for work to be exposed to the weather.

Weather-fastness tests are also sometimes carried out on dyed aluminum. The following test values have been given and are representative of typical results to be expected:

Duration of dyeing (min.)	*Loss of intensity after 1 year (%)*	*Designation of weather fastness*
5	25	Very good
30	30	
5	35	Good
30	30	
5	45	Moderate - good
30	35	
5	35	Moderate
30	45	

The dye should also, of course, resist leaching and samples may be tested by immersion in boiling water for upwards of an hour.

CONTROL OF DYE BATHS:

The quality of the dyed finish also depends on the temperature, time, pH and concentration of the dye bath and these should be strictly controlled. The pH is best measured with a glass electrode, by titration against N NaOH or N H_2SO_4.

The concentration of the dye is usually too difficult to determine by chemical analysis and is therefore determined either by comparison in a tintometer, in Nessler tubes or by spectrophotometer against four standards, containing ¼, ½, ¾, and full dye concentration respectively. If necessary, the dye solution may have to be diluted. For some dye baths, on the other hand, volumetric methods for analysis have been developed.

Inorganic Dyes

These are in practice, less important than organic dyes as the color ranges obtainable are more restricted. The colors are more light-fast and more heat-resistant, though not generally as bright. Thus, while organic dyes frequently change color at just over 100°C., many inorganic dyes will not change up to the melting point of the metal.

There are two methods in use for the application of inorganic dyes:

(A) The coating is treated consecutively with two compounds which react to form a pigment, e.g.:

Red brown: The work is immersed in copper sulphate solution, then in potassium ferrocyanide solution:

$$2\,CuSO_4 + [Fe(CN)_6]K_4 \rightarrow [Fe(CN)_6]\,Cu_2 + 2K_2SO_4]$$

Brown: Silver nitrate and potassium dichromate or chromate:

$$2AgNO_3 + K_2Cr_2O_7 \rightarrow Ag_2Cr_2O_7 + 2KNO_3$$

Dark brown: Lead acetate and ammonium sulphide:

$$PbAc_2 + (NH_4)_2S \rightarrow PbS + 2NH_4Ac$$

or Cobalt nitrate and hydrogen peroxide in ammoniacal solution:

$$2Co(NO_3)_2 + H_2O_2 + 4NH_4OH = 2Co(OH)_3 + 4NH_4NO_3$$

Yellow: Lead acetate and potassium dichromate or chromate:

$$PbAc_2 + K_2CrO_4 = PbCrO_4 + 2KAc$$

or Cadmium acetate and ammonium sulphide:

$$CdAc_2 + (NH_4)_2S = CdS + 2NH_4Ac$$

White: Lead acetate and sodium sulphate:

$$PbAc_2 + Na_2SO_4 = PbSO_4 + 2NaAc$$

Blue: Potassium ferrocyanide and ferric sulphate or chloride:

$$2Fe_2(SO_4)_3 + 3[Fe(CN)_6]K_4 = [Fe(CN)_6]_3Fe_4 + 6K_2SO_4$$

Black: Cobalt acetate and sodium sulphide:

$$CoAc_2 + Na_2S = CoS + 2NaAc$$

Similarly, *green* is obtainable from the reaction between copper sulphate and sodium arsenite and *orange* from antimony potassium tartrate and hydrogen sulphide.

Frequently it does not matter in this process which of the compounds is absorbed first. One per cent solutions are generally suitable and the temperature is normally kept low. If one treatment does not produce sufficient color intensity, the process may be repeated.

Heating the film to 150° to 200°C. improves the porosity and hence the absorption. Alternatively, higher current densities or temperatures in the anodizing process may achieve the same result. Pure whites are difficult to obtain. Frequently non-aqueous solvents such as ethyl alcohol may replace water with lead acetate, ferric chloride, cobalt nitrate, zinc chloride and copper salicylate. Similarly, methyl alcohol is used as a solvent for barium bromide, potash for silver perchlorate and carbon disulphide for antimony chloride in order to increase pigment adsorption.

(B) The coating may be dipped into a solution of a heavy metal salt which is hydrolyzed within the coating to give the pigment. This method may be used to obtain an old brass color by immersion in 5 to 10 per cent ferric oxalate or 2 to 5 per cent ammonium oxalate. Other solutions that may be used include also an acetic acid solution of ferric chloride, a mixture of ferrous sulphate and potassium ferrocyanide, and potassium permanganate solution.

Multi-colored Effects

Several methods exist for achieving either mottled effects or the formation of definite designs.

(A) According to one method,[13] lead or antimony arsenite or sulphide is formed in the coating by immersing the work first in 20 per cent lead acetate solution and then in an ammonium sulphide solution at 18° to 27°C. By agitating the work slightly, the film is broken at points allowing the sulphide to penetrate locally to give an insoluble, irregularly-distributed precipitate. Other colors can be obtained with other salts, e.g., ferrocyanide, sulphate, etc. More than two colors can be obtained also by precipitating different salts. A well-defined outline can be given to the mottled areas by applying the metallic salt through a silk screen.

(B) The work may be dyed one color and allowed to dry. A second dye is then applied by means of a sponge, the work dried and subsequently sealed by steaming. Alternatively, the colors may be applied repeatedly with a camel-hair brush[14] to the dry film after which they are sprayed lightly with water to allow them to run into each other. In both cases, the dye solution is thickened in the first case with 20 per cent of a solution containing:

Indian corn starch	750 g.
Tapioca starch	250 "
8% gum tragacanth	2,250 "
Water to	10 liters

In the latter case, the dye is thickened with glycerin, which is dried off in an oven subsequent to dyeing.

Alternatively, the dye may be rolled on to flat sheets with a rubber roller and transferred by rubber blocks cut to a pattern, while in yet another method,[15] the dyed coating is bleached with nitric or sulphuric acid or with a hypochlorite and re-dyed in a second color. Reducing agents such as titanium chloride may also be employed.

(C) The dyestuff may be applied in a 2 per cent thickened solution with a spray gun, either obtaining graded patterns of varying color intensity or, alternatively, designs may be obtained by spraying through a stencil or wire mesh held close to the aluminum. Different colors may be sprayed with different spray guns held at various angles and the metal is subsequently dried in air or in an oven at 60°C. After drying, if the thickened paste is still in position on the surface, the work may, if desired, be dyed again in a cold dye bath, the thickener acting as a stop-off. The work may then be steam-sealed and the starch removed by rinsing.

For more accurate work, i.e., designs or lettering, a method developed by the British Aluminium Co. Ltd. was described by Henley[16] and consists in stretching a fine silk screen, held across a frame, above the work after dyeing the palest color. The area of the silk screen to be stoped off (which is the area to be dyed the second color) is covered with black adhesive paper and printing ink containing toluene is forced through the silk screen. This acts as a resist after drying, and the rest of the film is then bleached with hypochlorite or with acids, e.g., a mixture of 10 per cent nitric acid and 20 per cent sulphuric acid, concentrated nitric acid, mixtures of potassium permanganate with nitric or phosphoric acid, or chromic/hydrochloric acid mixtures. The work is then rinsed and dyed with the second color. The process may be repeated as often as desired for more colors. All dye solutions must be used cold as hot solutions might to some extent seal the coating.

Printing can also be carried out by applying the resist on an offset printing machine. Very accurate designs may be obtained by applying an asphalt coating over an oil-base litho ink,[1] stripping the remaining anodic film in 10 to 15 per cent sodium hydroxide, a 20 per cent solution of equal parts of hydrofluoric and nitric acids, or boiling 10 per cent acetic acid, and redyeing. The resist is removed with an organic solvent.[17]

In a process described by Taylor,[18] designs are printed on anodized aluminum by use of oil-base lithographic printing inks, cellulose or oil paint, etc., as a resist. This is applied on to anodic coatings which have been produced in 15% sulphuric acid at 60° to 65°F., 10-15 v. for 30-45 minutes. The oxide coating is then removed from the unprotected areas with hot 10% acetic or chromic-phosphoric acid solution. Finally, the background may be polished with a lightly-greased buff.

The Indian workers Dhingra *et al*[19] found bleaching to be more satisfactory than superimposition in obtaining multi-colored designs and suggested the use of a 10% solution of asphalt in benzine as a resist.

Photographic Processes

Similarly to inorganic dyeing processes, light-sensitive salts may be absorbed into the pores of the coating, as in the "Seo" photographic process.[20] Both sulphuric acid coatings and chromic acid coatings[8] may be employed for this process, and the work may be either immersed in a solution of the photo-sensitive material or, where these are insoluble (e.g., silver halides), they may be produced within the film. In the first class are solutions containing 1 per cent iron chloride and 3

per cent tartaric acid, iron-silver mixtures, etc., which are developed with gallic/oxalic acid mixture, and diazo salts. Alternatively, the work is immersed first in a solution of the ammonium halide and subsequently in silver nitrate solution, or it may be prepared by centrifuging the work with a highly concentrated solution of ammonium chloride and sodium bromide, drying and immersing for 10 minutes in 10 per cent silver nitrate at 30°C., with subsequent rinsing and drying. This is developed with acid developers such as potassium oxalate, ferric sulphate or citric acid.

The exposure is carried out with a carbon arc behind a negative of glass, film, or stencil, with an average time of 1 minute at a distance of 9 in. from a 2 kw. lamp.[1] Fixing is carried out in the ordinary way with gold chloride, after which the film is sealed in a nickel or cobalt solution.

Color photography may be carried out by the three-color process, i.e., exposure to three negatives in turn, producing the red, yellow and blue primary colors respectively. By an alternative method,[22] the work is treated for 15 minutes at 20°C. in a 1 per cent glue solution, then at 85°C. for 1 hour in a solution containing 0.25 parts by weight of an ester of a leuco dye,[23] 0.12 parts by weight of 80 per cent acetic acid, 0.015 parts of cellulose spent liquor, 0.01 parts by weight of a formaldehyde-bisulphite addition product and 100 parts of water. A final treatment is given in 0.2 per cent 66° Bé sulphuric acid and 0.1 per cent sodium nitrite at 70°C. Blueprints are produced by impregnation with ferric ammonium citrate and potassium ferrocyanide, after which the work is exposed and developed as before.

In a Russian process,[24] anodic oxide coatings of 0.4-0.6 mil thickness are obtained in 10% sulphuric acid at 30°C., 15 amp./sq. ft. in 45-60 minutes. Subsequently, silver bromide is precipitated by immersion in 10% potassium bromide followed by immersion in 10% silver nitrate solution, the cycle being repeated many times as it was found that, even after 39 immersions, only a third of the pore volume was filled with silver bromide.

The highest speed in developing was obtained with an amidol developer, though hydroquinone can also be used. Higher potassium bromide concentrations are necessary than in normal developing to prevent fogging.

Interference Color Process

Recently, a new process using a combination of etching, barrier film anodic oxidation and vacuum evaporation has been developed by Polling and Charlesby[25] for the purpose of obtaining colored and grained decorative effects.

The basis material may be commercial quality aluminum which is strain-annealed at 500°C. for 1-4 hours using rollers. The surface is then etched in a solution containing:

Hydrofluoric acid	15% (vol.)
Hydrochloric acid	45%
Nitric acid	15%
Water	25%

at room temperature for 2 to 3 seconds. The etching process bares the grain boundaries and the metal is then anodized in ammonium borate or tartrate electrolyte. The voltage depends on the color required as the film thickness is a function of the applied voltage.

The interference colors formed by this process are emphasized by subsequent application of a thin semi-reflecting deposit of aluminum, silver or gold by vacuum evaporation. The whole deposit is then protected by a clear lacquer. A large number of shades are obtainable by the process, depending on the voltage used in anodizing while the grain size can be varied by varying the annealing time, longer annealing time giving a larger grain.

Although the process is stated to be of practical significance for quantity production, the cost of a process involving strain annealing, etching, anodizing, vacuum evaporation, and lacquering must restrict its use, particularly as fairly strict control of the individual processes would be necessary to obtain uniform results.

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Plating Tin on Aluminum

By J. M. Bryan

SOLDERING aluminum with alloys of tin involves difficulties which are well known. The surface film of oxide prevents the solder from binding effectively with the underlying metal. For this reason, normal electroplating technique for plating metals on aluminum is unsatisfactory and the most successful method developed for commercial use depends upon the replacement of the oxide film with zinc by treating the metal in alkaline sodium zincate solution. The zinc binds well to the aluminum and provides a base for the electrodeposition of various metals. Recently, the use of ultrasonic methods for disrupting the film has proved helpful in solving soldering difficulties.

The present work was undertaken to ascertain whether a satisfactory deposit of tin could be formed by simple chemical displacement which would serve either by itself as a surface finish for aluminum or as a base for soldering and electroplating. Easy soldering would, of course, permit the fabrication of aluminum cans by methods similar to those used in the fabrication of tin-plate cans.

Tin, like zinc, possesses amphoteric properties and can be deposited on aluminum from solutions in which the tin is present either as a cation, e.g. tin chloride, or as an anion, e.g. sodium stannate. A study of the literature shows that deposition of tin has been obtained from (i) stannous chloride solution (10 g./L.) followed by heating the metal for 5 min. at 500°-600°C. to effect reduction and diffusion of the tin into the aluminum;[1] (ii) a solution containing stannous chloride (15 g./L.) and ammonium alum (20 g./L.) by heating for a few minutes at 40°C.;[2] (iii) a solution of stannous chloride (15 g./L.) and sodium hydroxide (40 g./L.) by heating at 40°C.;[2] (iv) a solution containing stannous sulphate (1-5*N*), hydrofluoric acid (2-0 *N*), hydrolized glue (1 g./L.), goulac (0-2 g./L.), purified residue acid (1-3 ml./L.) by heating for 5-10 sec. at 25°C. after suitable preparation of the metal surface;[3] (v) a solution of sodium stannate (40-130 g./L.) and sodium acetate (7-30 g./L),[4] and (vi) a plain solution of sodium stannate.[5]

The tin deposit obtained by method (iv) was found to be less satisfactory for subsequent electrodeposition than a zinc deposit obtained from a similar type of solution, but was much better than a tin deposit obtained from stannate solution. The deposit obtained from stannate solution, although unsatisfactory for either soldering or electrodeposition, has an important commercial application in the internal combustion engine industry, being found valuable for tinning aluminum alloy pistons to prevent scoring and scuffing during the "running-in" period.[6,7]

Experimental

Tests were made with two types of plating solution, one type containing tin as a cation and the other as an anion. The metal test pieces measured 3 in. × 0.5 in. and were cut from commercial aluminum sheet of 99.3 per cent purity (analysis: Si 0.18, Fe 0.46, Cu 0.01, Mn 0.01, Zn 0.01, Mg trace, per cent) in half-hard temper. The etching and plating solutions were heated on hot water baths in boiling tubes containing 100 ml. The quality of the plating was assessed by inspection under a binocular microscope and by scratching and cutting with a penknife. In measuring the adhesion of coatings, advantage was taken of the fact that the synthetic resin "Araldite" adheres more strongly to tin than a tin coating adheres to aluminum. A suitable apparatus was therefore devised to measure the force required to pull off an "Araldite"-bonded tin coating from the underlying aluminum.

Solutions Containing Tin As a Cation

Owing to the presence of the surface oxide film on aluminum, the nature of the anion has an important influence in plating. In general, metals plate out more readily on aluminum from chlorides than from sulphate solutions. This is mainly because the chloride ion is much smaller than the sulphate ion and can penetrate the oxide film more readily. For instance, in plating copper from chloride solution the action is very rapid and a loose deposit results, whereas with sulphate solution the action is restrained and a good, adherent deposit can be formed. On the other hand, in plating tin, which is less noble, deposition was poor from sulphate solution but good from chloride solution, hence it seems that the plating of tin requires the assistance of a small anion, such as the chloride-ion. The high over-voltage of hydrogen on tin favors the formation of dense and impervious deposits, but thick deposits cannot build up because the current required for plating must necessarily be generated by aluminum passing into solution and this diminishes (unless pitting sets in) as the surface become covered with tin. An efficient preliminary acid etching treatment was found necessary to obtain the thickest and most adherent coatings and the one devised in this laboratory for plating nickel directly on aluminum

*Reprinted from Metal Industry

was used.[8] This comprised an alkali treatment followed by an acid etch with the following solutions:—

Alkali solution: NaOH 50 g., Lissapol N 3 g., Water to 1 L.

Acid solution: HCl (conc.) 2.5 ml., CCl_3COOH (melted crystals) 50 ml., H_3PO_4 (S.G. 1.75) 250 ml., Lactic acid (S.G. 1.21) 200 ml., Lissapol N 3 g., Water to 1 L.

The aluminum was immersed in the alkali for 5 min. at room temperature, washed in water, then immersed in the acid solution for 1 min. at 75°C., washed again and immersed in the plating solution. The plating solution which gave the best results contained tin chloride, Rochelle salt and sodium hydroxide. The alkali precipitates tin hydroxide which then, under the influence of heat, reacts with the Rochelle salt to form a soluble complex. The function of the Rochelle salt in improving the plating is no doubt due to the complex ion which, by suppressing the formation of tin-ions, lowers the rate of deposition. Another advantage of the complex ion is that it reduces the loss of tin through hydrolysis and precipitation of tin hydroxide. The chief difficulties encountered in plating were the roughness of deposits and the pitting of the underlying metal and, since certain additions, particularly colloids, are known to refine the grain and improve the coverage of electro-deposits of tin, the effect of some of these was tested. Glue and gelatine improved plating equally, the best concentration being in the region of 4.5 g./L. Surface-active agents like Perminal BX (2 g./L.) or β Naphthol (1 g./L.) had no effect and with Igepon T (2 g./L.) the results were inconclusive, being slightly beneficial with unpolished deposits and slightly detrimental with polished deposits.

Pitting was overcome by adding sufficient alkali to raise the pH to 7.0-7.5. The effect of additions of sodium hydroxide on the pH of a plating solution containing $SnCl_2.2H_2O$ 100 g./L.), Rochelle salt 200 g./L., hydrolyzed glue 5 g./L., is as follows:—

NaOH added g./L.	*pH*
16	5.8
18.8	6.0
20.8	6.2
22.4	6.4
24.8	7.3

The solutions were prepared by dissolving the alkali and the Rochelle salt in water, heating the solution on a water bath, and then adding the tin chloride a little at a time to allow the Rochelle salt to dissolve the precipated tin hydroxide. When heating had cleared the solution, the glue previously dissolved in a little water, was added and the whole diluted to 1 liter. The tin-tartrate complex precipitates out in the cold but is soluble on heating. The pitting diminished with increasing concentration of alkali and disappeared when 24.8 g./L. had been added (pH 7.3). The addition of alkali in excess of this amount produced a precipitate which would not re-dissolve on heating. A precipitate (probably mainly $Al(OH)_3$) also formed in the other solutions with use but this did not appear to be detrimental to plating.

The duration of the acid etch was an important factor in plating. With a ½ min. etch at 75°C., insufficient removal of the oxide film resulted in localized action and pitting of the aluminum during plating; with a ¾ min. etch the pitting was less pronounced and with 1 min. etch it was absent. With a 1½ min. etch the plating was noticeably rougher; hence the optimum time of etch was therefore 1 min. at 75°C. The texture of the deposit also depended upon the time and temperature of plating. At 70°C. the deposit was thin but smooth after 2 min., thicker and less smooth after 3-4 min. and rough and uneven after 5 min. The optimum time of plating at 70°C. was, therefore, 3-4 min. At higher and lower temperatures the time of plating must be correspondingly shortened and lengthened.

Plating for 4 min. at 70°C. with a solution of pH 7.3 gave a deposit about 0.0002 in. thick and requiring a pull of about 1½ ton/in^2 to overcome its adhesion to the aluminum after hand polishing. The surface was dull grey in color after plating but bright when polished. Electroplating with tin over this deposit in the following bath[9] for 5 min. at room temperature with a current density of 35 amp./ft.^{2} gave a deposit about 0.0004 in. thick with no change in the adhesion.

Pure tin 30 g. (dissolved anodically in the acids).
H_2SO_4 (S.G. 1.84) 70 g.
Cresol-sulphonic acid 50 g.
Glue 2 g.
Water to 1 L.

The results of soldering tests were disappointing in that both types of deposit (chemical and electrochemical) could only be soldered with difficulty.

Solutions Containing Tin As a Anion

As mentioned previously, the tinning of aluminum alloy pistons is done commercially by simple immersion in a solution of sodium stannate after suitable pre-treatment of the surface. Blisters appear in the deposit if the metal is overtreated and since the time of immersion is both brief and critical the plating process requires very careful control.

Since a stannate solution is much more reactive than a chloride solution for plating, it was realized that plating with the former would require a much lighter etch. The effect of both acid and alkali etchants in relation to plating was investigated.

Acid treatment. In general the action of acid etchants tended to be localized and this gave rise to slightly rough plating. Out of a large number of tests using various acid mixtures and different temperatures for etching and plating, it was concluded that plating for short times (1-2 min.) at moderate temperatures (50°-60°C.) provided brighter and more silvery deposits than plating for longer times at lower temperatures and the following process gave the best results:—

Immerse the aluminum for 5 min. in sodium hydroxide solution (50 g./L.) at room temperature; rinse in cold water; etch in an acid mixture containing 300 ml. phosphoric acid (S.G. 1.75) and 200 ml. concentrated nitric acid for 5 min. at 60-65°C.; rinse in cold water, and plate in 100 g./L. sodium stannate solution for 1 min. at 55°C. This concen-

tration of stannate gave a smoother deposit of tin than did a solution containing twice the amount (200 g./L.). Temperatures higher than 65°C. could not conveniently be used for etching on account of the objectionable acid fumes given off. The deposits were brighter and smoother but less adherent than those obtained by plating with stannous chloride.

It was found possible to deposit tin from stannate solution over a zinc layer formed by immersing the metal in sodium zincate solution after a suitable etching treatment. The procedure used for etching and deposition of zinc was that used in electroplating metals on aluminum by the "Sodium Zincate" process.[10] The tin coating was very smooth but was dull grey in color and less attractive in appearance than the normal silver colored deposit. The zinc layer did not appear to be advantageous either in delaying the formation of blisters or in improving the adhesion of the tin plating.

It has been reported that potassium stannate possesses advantages over sodium stannate for electroplating;[11,12] hence at this stage in the work some comparative tests were carried out with solutions of the two salts in equivalent concentrations.

Potassium Stannate v. Sodium Stannate

Using the same preliminary etching treatment as before, strips of aluminum were plated by immersing them in 0.4 N solutions of sodium and potassium stannate for different periods of time at 55°C. It was observed that the potassium stannate solution was slower in action and the deposit brighter and more adherent and continuous than with the sodium stannate solution. Blisters eventually formed in the deposit from both solutions, but they were slower in forming with potassium stannate on account of its lower activity. Another advantage of potassium stannate was that there was much less loss of stannate through hydrolysis and precipitation of tin hydroxide. This would tend to offset the slightly higher cost of the potassium salt.

It was thought that the difference in the plating characteristics of sodium and potassium stannate might be related to the free alkali content of these salts which is much higher in the sodium salt than in the potassium salt, as shown by the following figures, which were estimated by the method given in Publication No. 29 of the International Tin Research and Development Council.

	per cent
Sodium stannate, sample 1	4.86
" " " 2	5.08
Potassium " " 1	0.42
" " " 2	0.71

The corresponding pH values for solutions of different strength are given in Table I.

In order to decide whether the differences in the plating characteristics of sodium and potassium stannate are due entirely to the difference in the free alkali content of the two salts or whether the cation also had some influence, a further test was carried out with an 0.4 *N* solution of potassium stannate containing sufficient added alkali to bring the pH to that of the 0.4 *N* solution of sodium stannate. The results showed that the addition of alkali lowered the adhesion of the deposit, but the plating was still somewhat brighter and better in appearance than that obtained with the equivalent solution of sodium stannate. It is known that potassium and sodium stannate solutions differ considerably in their physical properties. Potassium stannate is more soluble than sodium stannate and the solubility increases with temperature instead of decreasing, as is the case with sodium stannate. Weiser[13] believes that the greater stability of potassium stannate solutions may be related to the greater peptizing ability of potassium hydroxide for hydrous stannic oxide. This is in keeping with the work and conclusions of Grillot[14] that sodium hydroxide reacts with hydrosols of α stannic acid to form a true solution, whereas potassium hydroxide reacts to form a colloidal system, as indicated by its viscosity, stability towards heat, and its gelation when part of the water is distilled off. Thus the differences in the plating characteristics of potassium and sodium stannate can be accounted for partly by the difference in the free alkali content of the two salts and partly by the difference in the physical properties of their respective solutions. In view of the superior plating properties of potassium stannate the remainder of the work was conducted with this salt.

Table I — Effect of Concentration of Sodium and Potassium Stannate on pH

Sodium stannate			Potassium stannate		
Normality	Concentration (g./L.)	pH	Normality	Concentration (g./L.)	pH
0.11 *N*	30	12.62	0.17 *N*	50	11.83
0.19 *N*	50	12.76	0.34 *N*	100	12.13
0.40 *N*	107	12.98	0.40 *N*	120	12.35
0.67 *N*	179	13.20	0.67 *N*	200	12.47
			1.0 *N*	300	12.84

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VENTILATION

By J. B. Mohler

The first half of this article appeared in the June issue.—Ed.

Spray

Alkaline spray due to electrolysis or etching of aluminum can be very irritating. A foam blanket produced by wetting agents will keep this spray down in electrolytic cleaners. Wetting agents are normally a part of the cleaner formula, but they may become depleted. It is well to keep a wetting agent on hand that can be added to increase the foam blanket, if required. Wetting agents and floating shapes, such as plastics, are also used to break up and trap spray at the surface of a chromic acid bath. With effective spray control severe conditions can become moderate to intermediate.

Hooding and ventilating may represent 5 to 20% of an installation cost and possibly a like percentage of operating cost in winter months. Thus it is a sizeable minor item. Costs can be kept down by spray control and hood design. Heating requirements for incoming air can be kept down by restricting the air flow when permissable and shutting down or closing off hoods that are not in use. Heating economies can also be realized by the use of a push-pull system or by scrubbing and recycling the air.

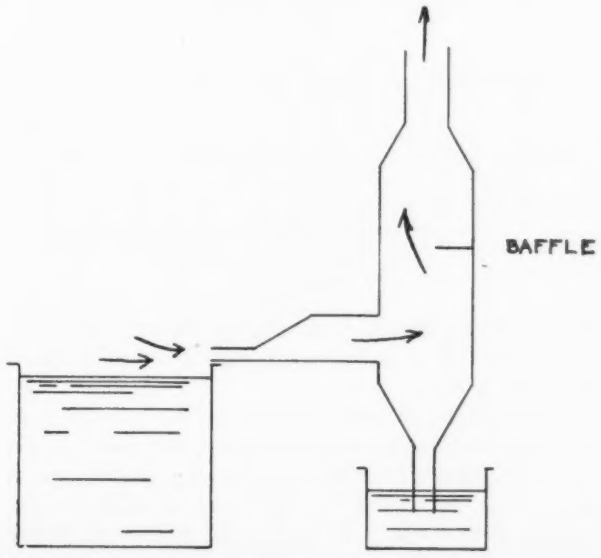

Figure 7.

Spray Removal

Removal of spray inside the ventilating system may allow recycling of the air. However, it is also often necessary to remove spray to avoid contamination of the outside air. In a great many cases it has been necessary to remove spray because of damage to the finish of passenger cars in plant parking lots. Daily exposure, that was not objectionable in any other way, has caused much damage to parked cars.

Spray can at times be removed by simple means, as in Figure 7. Almost any obstruction in the air stream will knock out a part of the spray. The means shown was used primarily to recover chromic acid which was returned directly to the plating tank.

Centrifugal separation is often an effective means for removal of spray. A centrifugal separator, as in Figure 8, may be used dry or supplemented by water or solution sprays. The water may be sprayed into the

Figure 8.

inlet stream and then allowed to flow to the sewer. Solution may be sprayed into the inlet to scrub the air and then collected and recycled for recovery of chemicals. Fine sulfuric acid and chromic acid spray are difficult to remove by centrifugal action unless the droplet size is increased by contact with a water spray.

Scrubbed air can be returned to the plating room for reuse in some special cases, and after "fail-safe" devices are incorporated to shunt the fumes to the outdoors automatically in case of a spray failure. The scrubbed and centrifuged air will leave the scrubber at the dew point and cooler than the room air. The conditions of the returned air depend on the humidity, the spray temperature, and the room temperature. The humidity will drop on heating and mixing with room air. However, a considerable amount of heat can be recovered by the reuse of such air. In warm months, the air can be exhausted outside. In other cases it is necessary to scrub air in order to vent to the outside at a non-damaging level.

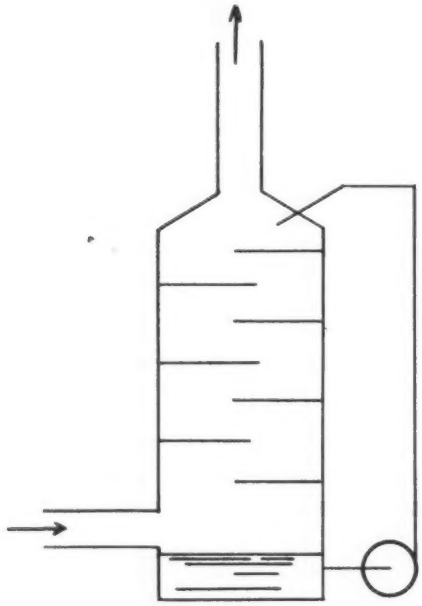

Figure 9.

Objectionable gases can be removed by solution in water or chemicals. Recycling, and baffled or packed towers, such as Figure 9, have been used for removal of hydrochloric acid and hydrofluoric acid fumes. Small amounts of such fumes may be vented outside, but large amounts are corrosive.

Push-Pull

Where ventilation is insufficient or has to be increased in an existing system, a commercial blowing unit may be placed on the front edge of the tank to produce a push-pull system. By the use of standard units, ventilation rates have been reduced from 200 to 50 cfm per sq. ft. The system is illustrated in Figure 10. The front unit consists of an air-directing fan housing that blows the air in the direction of the collecting hood opening. The amount of air blown or pushed is only a fraction of the amount of air pulled or collected. The system has been effectively used to save power and heat and to reduce the size of the exhausting equipment for original installations. It is an especially advantageous system for wide tanks and has been used for widths up to 6 feet.

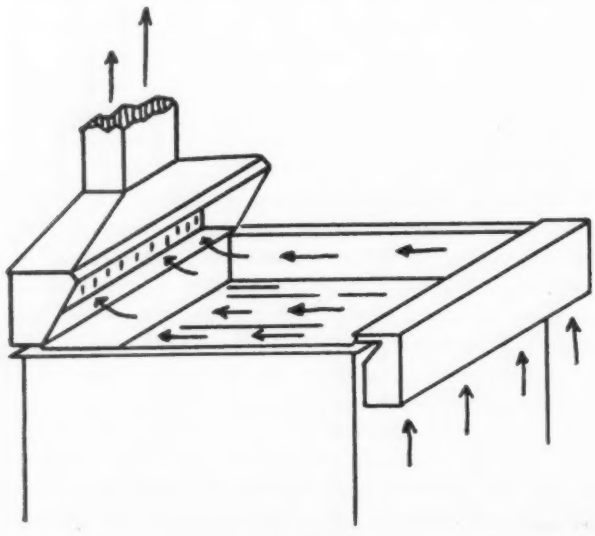

Figure 10.

Design Details

The characteristics and requirements for the common baths have been described by Postman[1] Further data, tables, construction details and references are given by Brandt.[2]

Plans for a new department or revision of an old department should take the ventilating system into account early in the planning stages. The system may require considerable space and it is not at all infrequent to find that rearrangement of the tanks is desirable for maximum economy. Such changes may not be considered or, possibly, cannot be considered after the basic layout is fixed. A ventilation engineer or fabricator called in at a later date may be limited by an inflexible system.

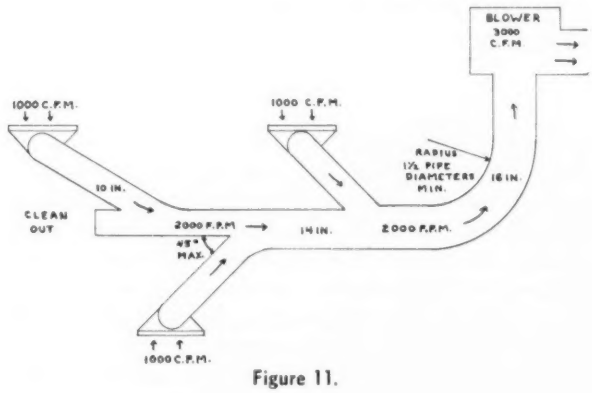

Figure 11.

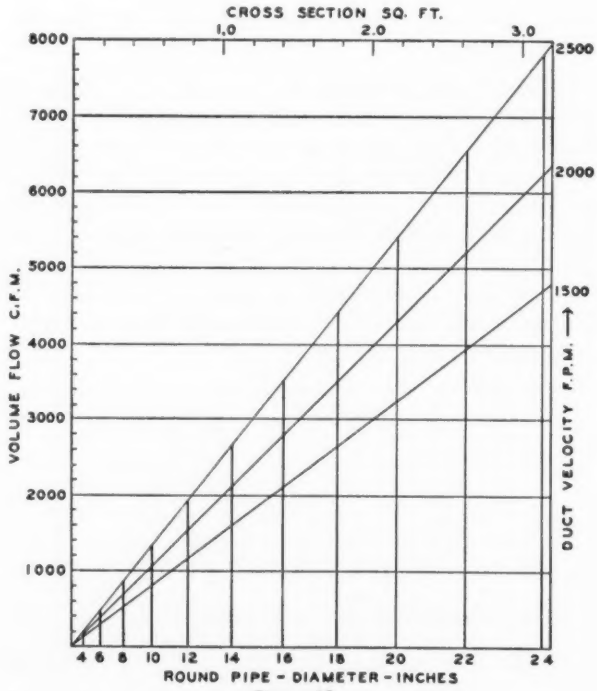

Figure 12.

From published recommendations for exhaust rates and duct velocities a preliminary design can be laid out, as in Figure 11. This top view of a typical system shows how duct sizes are increased to maintain the desired duct velocity, as read from Figure 12. Other points to keep in mind are to avoid sharp angles and allow for cleaning and draining the system. From the

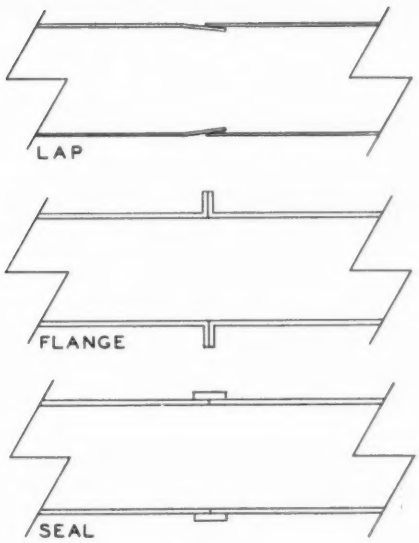

Figure 13.

requirements for air handling, the size and location of the system can be estimated. For a good preliminary estimate it is well to lay out both a floor plan and an elevation plan to determine clearances and the location for the exhaust outlet.

A chart of all the tanks giving chemicals, temperatures, electric loads, and hours of operation, will be helpful. Also, the provisions for inlet air should be indicated. From such a preliminary layout, health authorities, ventilation engineers, and fabricators can establish the final design.

Alternative possibilities will exist and exhaust practices may be permissable in a large space that are not allowable in a small room. In one case recycled air that was considered unhealthy for direct exposure was returned to a high building near the roof. General ventilation diluted the air and kept it near the roof as it moved to the general ventilation outlet. The air return was economic because of the heat value recovered.

Safe health practices should be kept in mind, but local health requirements should be checked, since allowances in crowded communities will differ from sparsely settled areas.

A number of details will be a matter of economy and preference rather than meeting specifications or recommendations. Materials and types of construction are matters of cost and erection.

Metal ducts are joined by conventioned sheet metal methods for obtaining tight joints. Flanged joints, as shown in Figure 13, are used for joining lined steel and plastic ducts and hoods. Plastic systems are also assembled by butting and sealing the joints. An advantage of this method is that parts can be manufactured slightly oversize and cut to an exact fit on the job.

The exhaust outlet is normally placed to avoid a long run of ducting. It is usually put through the roof and, if the fumes may be objectionable, the direction of prevailing winds should be considered. A conventional weather cap, as shown in Figure 14, is frequently used. The cap will increase the pressure requirements, but will keep rain out of a corrodible metal system,

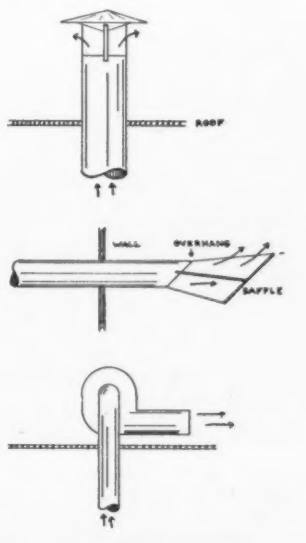

Figure 14.

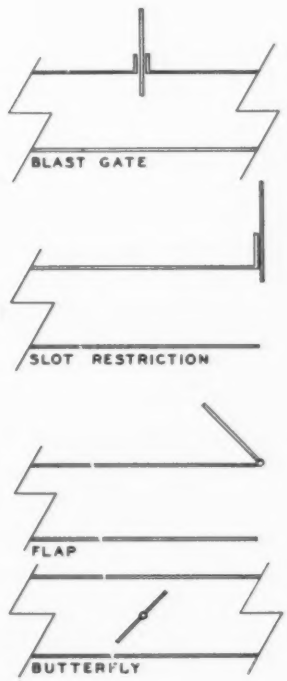

Figure 15.

such as galvanized steel. For a non-corrodible system, such as plastic, it is not necessary to use a weather cap, since rain water will merely enter the system and drain to the sewer through an outlet provided for draining of the system.

If the air is exhausted horizontally through a wall, an overhang on the pipe will keep out rain and a baffle will deflect and dispense any concentration of spray that may be carried through the system.

Blowers are frequently mounted on the roof and the exhaust may be directed horizontally to avoid the use of a weather cap.

If there is a reasonable doubt of the air requirements for the system, it will be good practice to provide for some regulation of the air flow at various points in the system. Various methods of air flow control are indicated in Figure 15.

Fans

Where there is little resistance to the flow of air, axial fans will move more air per dollar than any other

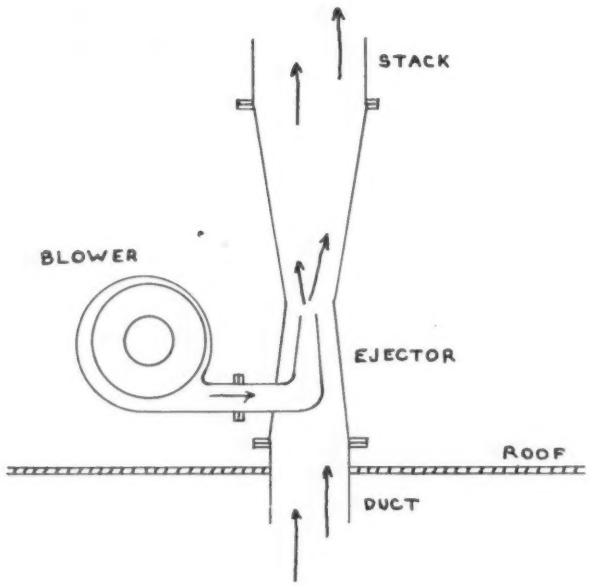

Figure 16.

means. Axial fans are used for economic installations up to 1½ inches static pressure. For the canopies of Figures 3 and 4 axial fans would definitely be used. If Figure 11 were an actual layout, an axial fan might be used, or a centrifugal blower. At higher static pressures axial fan efficiencies drop sharply. For static pressures above 1½ inches, light duty centrifugal blowers are used. Heavy duty blowers may be used up to 12 inches static pressure.

If it becomes necessary to increase the size of the system at a later date, blower capacity can be increased by increasing the size of the pulley and thus the speed of the blower. However, if a blower or fan is originally purchased to operate at the limit of its capacity, this will not be possible. It will be practical to install a little larger blower than required and to run initially at a lower speed if this is a reasonable possibility. *A few dollars for the next size blower can save many dollars in replacement at a later date.*

The inner air contacting surfaces of fans and blowers are frequently coated to obtain a satisfactory life. Solid plastic blowers are also available for corrosive fume removal. The plastic ejector shown in Figure 16 is used for a lower cost all plastic air moving device. The blower itself may be metal, since it does not come in contact with the corrosive fumes.

Acknowledgement

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Abrasion Testing Machine for Porcelain Enamels

A SIMPLE, rapid device for determining the abrasion resistance of porcelain enamels has been developed at the *National Bureau of Standards*. The instrument provides a reliable means for testing enamels having different types of finishes, including "orange peel" and wavy surfaces. While the abrasion tester was designed primarily for porcelain enamels, it can be used for determining the wear resistance of such other materials as highway paints, plastic and fibrous materials, and organic finishes. The instrument and test method were developed for the Porcelain Enamel Institute by *G. Warren* and *J. H. Giles*, PEI Research Associates at the Bureau.

Abrasion resistance is one of the most important factors in the service performance of protective coatings. Floor coverings are subjected to scuffing, and enameled sinks and cooking utensils are frequently scoured with cleansing powders containing fine abrasives. Since all enamels are not equally resistant to abrasion, techniques for predicting the service be-

(*Continued on page* 62)

Figure 1. PEI abrasion tester developed at the National Bureau of Standards for determining the abrasion resistance of porcelain enamels and other materials. Instrument provides a rapid, reliable method for testing enamels having different types of finishes, including "orange peel" and wavy surfaces.

Finishing Pointers

ANALYSIS BY UNDERSATURATION

AN analytical method called the Undersaturation Method was briefly described in the Nov. 1948 issue of METAL FINISHING. It is the purpose here to give more detail on this method of analysis.

This method is useful to control the concentration of a salt where no other practical method of analysis is available. The method was specifically applied to the control of the boric acid content in an acid tin bath, where the usual titration method could not be applied due to interference of the other chemicals present.

The method can be applied for control of boric acid in other baths and it can be applied as a general method to the control of other salts. The method is relatively simple, and does not take much time.

Essentially the method consists of a measurement of the amount of salt required to saturate a bath. This amount of salt is referred to as undersaturation. The undersaturation measurement in itself can be of value independent of the application of such a method as a means of control. For instance, the measurement of undersaturation of boric acid in a bright nickel bath could be of more importance than the measurement of the boric acid content.

Some of the bright nickel baths are operated at high salt concentrations. In fact, some baths are of such a concentration that salts will crystallize at room temperature. Under such conditions there is always danger that the bath will become saturated with respect to one of the salts at the operating temperature. If this happens and the salt crystallizes on the work, rough plating may result. Also, in some nickel baths, the boric acid concentration is quite critical and undersaturation offers another method of measurement.

In some cases it may be desirable to operate a bath with as much salt in solution as possible without danger of saturation. In such a case the undersaturation measurement becomes more important than the total amount of salt dissolved.

The simplified description of the method for boric acid is as follows.

Add 3 to 6 g. boric acid to 250 ml. of the bath. Add a few drops of wetting agent. Agitate for 1 hour. Filter on a small Buchner funnel. Wash with 10 ml. acetone and allow to drain. Pull dry for 15 minutes. The residue contains 20 per cent liquid.

This method essentially assumes that a bath can be saturated with boric acid by mechanical agitation for one hour, that essentially all of the solution can be washed out of the boric acid with 10 ml. of acetone without dissolving any appreciable amount of boric acid, and that, if air is pulled through the crystals for 15 minutes, the crystals will retain 20 per cent liquid.

Boric acid crystal should be used to saturate the sample. If powder is used the method will not be successful due to the difficulty of wetting the powder. Even when crystal is used a wetting agent should be added to facilitate wetting.

It is desirable to use a small amount of boric acid to saturate the sample. Such an amount that the sample will be easily saturated and yet leave a minimum of salt to be weighed. The smaller the amount finally weighed the smaller will be the errors due to retained liquid.

The method is simple. A weighed quantity of boric acid crystal is added to 250 ml. of bath in a 400 ml. beaker and the sample is agitated for one hour with a mechanical stirrer. A relatively large amount of salt is being handled by comparison with ordinary gravimetric analyses. Consequently the usual washing and handling techniques are not required. The sample with the crystals is dumped into a small Buchner funnel containing a filter paper. Small portions of acetone are added to the beaker to wash out residues of crystal and these are poured over the crystals in successive additions to a total of 10 ml. of acetone. Air is then drawn over the crystals for 15 minutes by the use of an aspirator and suction flask. It has been determined that the crystals will now contain 20 percent liquid.

The calculation would be as follows. Assume that 5 grams of boric acid were used and that 2.4 grams of wet crystal were weighed. The amount of dry salt undissolved is:

$$2.4 \times 0.8 = 1.9$$

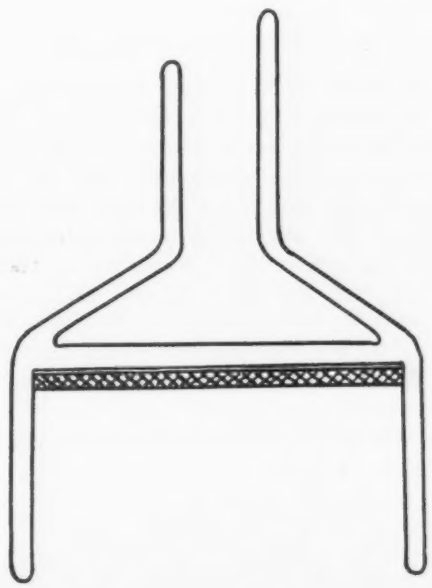
The amount of salt dissolved:

$$5.0 - 1.9 = 3.1$$

The undersaturation is:

$$3.1 \times 4 = 12.4 \text{ g./l.}$$

The boric acid content of the bath can be calculated



from a knowledge of the amount of boric acid necessary to saturate the bath. This is about 45 g./l. In this case the boric acid content would be:

$$45 - 12 = 33 \text{ g./l.}$$

As previously stated, the undersaturation limits may be more important than the boric acid content. Consequently, it may be of advantage to state the boric acid requirements in terms of undersaturation. Rather than to specify 25 to 35 g./l. of boric acid; specify 10 to 20 g./l. of undersaturation.

The method is sufficiently accurate for a control procedure. If greater accuracy is desired it can be obtained by drying the crystals in an oven to eliminate variations in the liquid content of the wet salts.

If the method is used as a general method, a study of the solubility of the salt used for saturation of the sample will be necessary. The salt cannot be washed with water or any other liquid in which it is soluble. Also a study should be made of the time required for saturation and the time and temperatures necessary to dry the salt if required. It is also possible that an estimate can be made by agitation in a tall beaker, settling and measurement of the depth of the settled salt. Such a method could be simple and rapid but would require careful evaluation and standardization.

ABRASION TESTING MACHINE

(*Continued from page* 60)

havior on the basis of laboratory measurements are of considerable value to porcelain-enamel manufacturers. The Bureau, in cooperation with the Porcelain Enamel Institute, has been working for a number of years on the development of suitable methods and instruments for testing surface coatings. The most recent result of this work is the PEI abrasion tester.

The instrument consists essentially of a motor-driven table gyrating in a horizontal plane at 300 rpm. The table moves parallel to itself, and describes a circle 7/8 in. in diameter. The table is driven by a 1/4-h.p. synchronous motor, and testing time is accurately controlled by an electric timer. Nine specimens, 4 1/2 in. sq., can be fastened to the table for simultaneous testing.

A specimen is placed in one of the nine available positions on the table and secured with a rubber-coated aluminum retaining ring. An abrasive charge consisting of 3 g of abrasive grit, 175 g of stainless steel balls (5/32 in. diam.), and 20 ml of water is poured into an accessory hole in the top of the retaining ring. The apparatus is then set to oscillate for the required time. The effectiveness of the abrasive is increased by the motion of the steel balls on the moving specimens.

Two Test Methods Devised

Two test methods have been devised; one for determining surface abrasion resistance and the other for subsurface abrasion resistance. The surface abrasion test is used when appearance is the main consideration, but the subsurface test method is followed when protection of the underlying metal is the more important. In the first method, Pennsylvania glass sand, between 70 and 100 mesh, is used in the abrasive charge, and the test is run for five minutes. The specular gloss is measured before and after the test, and the percentage retained gloss at 45° is the surface abrasion index.

For determining subsurface abrasion, a coarse fused alumina grain is used for the abrasive grit, and the test is operated for 45 minutes. The slope of the portion of the abrasion time-weight loss curve between the 15- and 45-minute points is taken as the abrasion index. The specimen is weighed at the end of each of three 15-minute abrasion periods; a fresh charge is inserted at the beginning of each period.

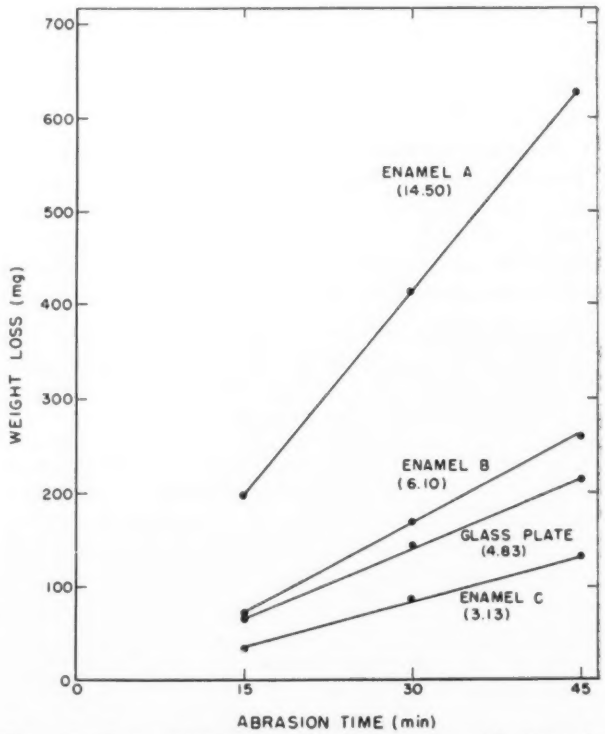


Figure 2. Curves illustrating relationship between weight loss and abrasion time for three porcelain enamels and a glass plate tested in the abrasion tester. Numbers in parentheses are the slopes in mg/min. Each curve is almost a straight line; for porcelain enamel this relationship holds until the enamel is penetrated and the underlying ground coat or base metal is exposed.

Tests of several porcelain enamels in the abrasion tester at four cooperating laboratories have led to the conclusion that the two test methods give satisfactory reproducibility. Results of the experiments show that the indices of abrasion resistance assigned to the various enamels are in general agreement with service experience.

Science for Electroplaters

16. Motors and Generators

By L. Serota

ELECTRICAL power requirements for electrolytic processes are a high current, low voltage and a direct current source. Transmission of current over appreciable distances at an emf as low as 6-12 volts would not be practical, because large copper conductors would be required to reduce the power losses. The cost for such installation would be too high. Instead, alternating current power from a commercial source (208-240 volts) is converted to direct current at the desired voltage by a motor-generator set or rectifier. Electroplating generators of the high-current, low voltage type are driven by motors which utilize power from an a-c line.

Alternating Current

The principle of a generator is based upon the effect produced when a loop (or loops) of insulated wire revolves or rotates in a magnetic field in such manner that the coil of wire cuts across the lines of magnetic force (flux). Cutting the lines of force will result in an electromotive force being induced in the coil, thereby causing a current to flow. This is demonstrated diagrammatically in Fig. 49.

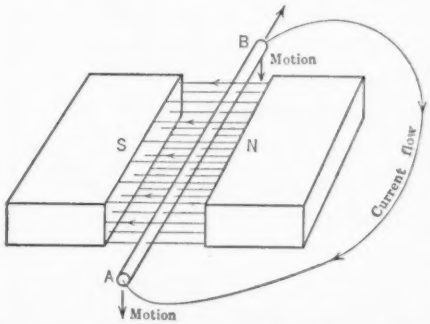


Fig. 49. An e.m.f. is induced in the wire from A to B when the wire cuts down across the magnetic flux.

If a loop is arranged so that it will rotate on an axis, at constant speed, in a magnetic field, the current in the revolving coil (loop) will flow in one direction during half the revolution (180°) and in the opposite direction during the second half of the complete revolution. This variation or alternating effect can be shown by a series of diagrams.

When the coil is in a vertical position, as in Fig. 50, it is not cutting the lines of force of the magnetic field; hence no emf is being induced. This is considered the zero position. If a quarter turn (90°) is now made in the direction of the arrow (near the handle) in Fig. 51, the maximum voltage is induced, (lines of force are cut at the greatest rate) causing a current to flow around the coil in the direction indicated by the arrows and marked ADCB. This is in accordance with the right hand rule (Fleming's) for induced emf, Fig. 52. A second quarter turn would place the coil in a vertical (zero) position (180°) again, with the side of the coil marked AC on top. When the revolving loop is in the position shown in Fig. 53 (the third quarter turn — 270°) the induced emf (voltage) causes the current to flow now in the direction marked BDCA, which is the reverse of the current direction when the coil was in the first quarter turn position. Completing the cycle of turns (360°) for the coil restores it to the position where no voltage is induced again, since the sides move parallel to the lines of force.

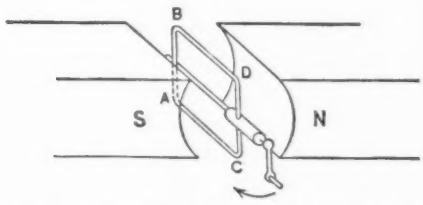


Fig. 50. No voltage is induced when the loop is in this position.

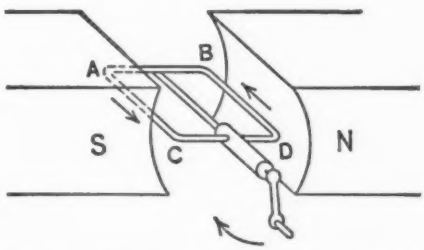


Fig. 51. With the revolving loop in this position a maximum e.m.f. is induced in the direction DBAC.

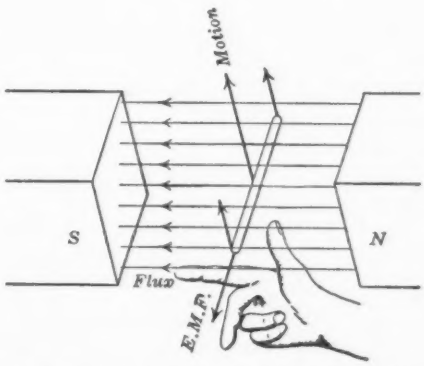


Fig. 52. Right-hand rule for induced e.m.f.

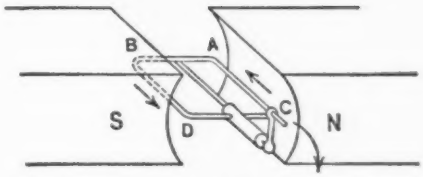


Fig. 53. With the revolving loop in this position a maximum e.m.f. is induced in the directed CABD.

The current that is generated in a coil revolving in a magnetic field, it is seen, will flow in one direction for the first half of the revolution (180°) and in the opposite direction during the second half of the complete turn (360°), producing an alternating current which changes (reverses) its direction twice for each complete cycle. This change of induced emf starting at zero, going up to a maximum, and then dropping to zero again for half a turn (180°) is represented graphically in Fig. 54, where the position of the loop at each quarter turn is plotted, giving a sine curve. A standardized graphical representation for a sine curve for induced emf is shown in Fig. 55.

The induced emf may be increased, by moving the wire across the magnetic field at a faster rate, increasing the strength of the magnetic field, or using more turns of wire (in coil).

Direct Current

If each end of the single-coil generator is connected separately to an insulated slip ring or collecting ring, as R_1R_2 in Fig. 56, an alternating voltage and current, C_1C_2 will be delivered to an external circuit, such as a lamp bank L, through the brushes B_1B_2.

To convert the alternating current to direct current or one which flows continually in the same direction in the external circuit, a split ring or commutator, as S_1S_2 in Fig. 57, is attached to each end of the single coil C_1C_2, instead of the slip rings which deliver alternating current. The sections (segments) of the commutator are insulated from each other and from

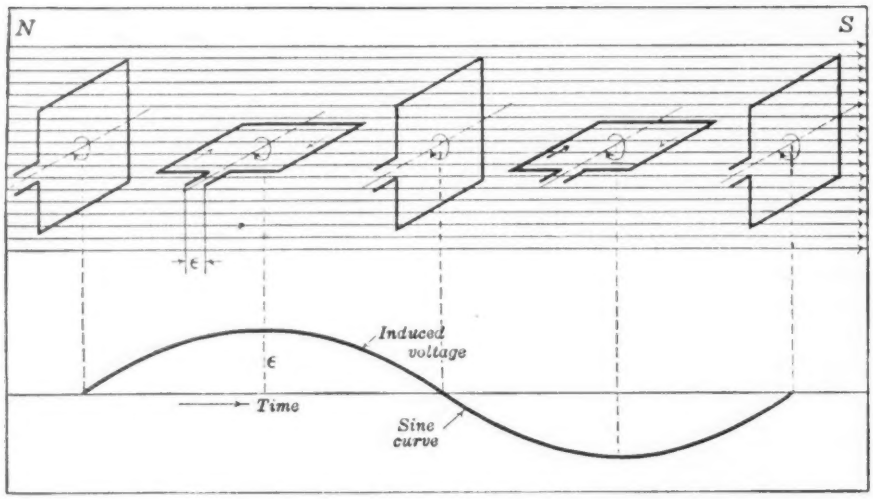


Fig. 54. Curve showing relation of induced e.m.f. to position of loop.

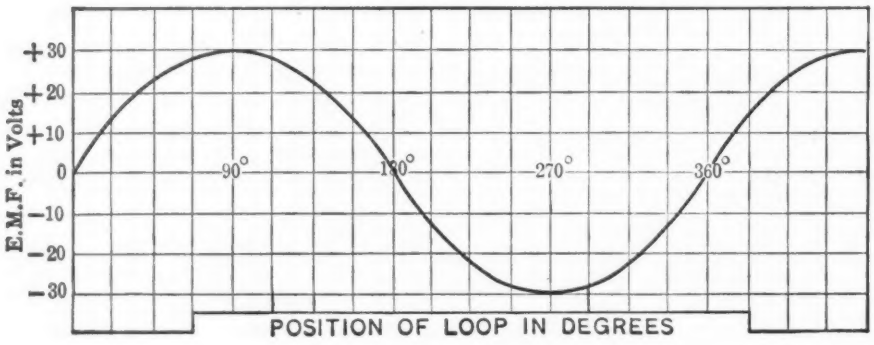


Fig. 55. A sine curve of induced e.m.f.

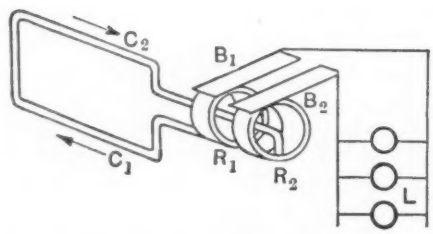


Fig. 56. The collecting rings deliver an alternating current to the brushes.

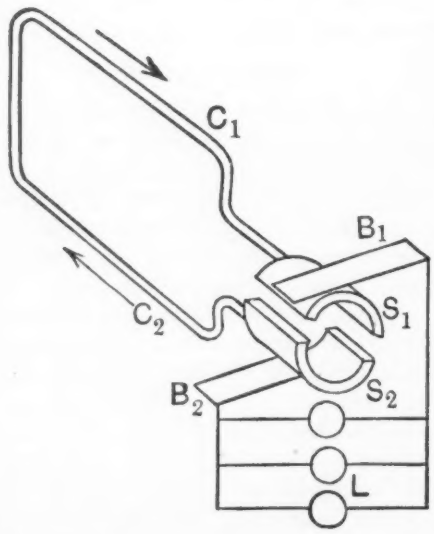


Fig. 57. The commutator delivers a direct current to the brushes.

the shaft. The brushes B_1B_2 are adjusted, so that changes to the sections (of the commutator) occur at the instant when the voltage and current on each side of the coil C_1C_2 are being reversed. This will occur when the coil is in a vertical (zero) position. The direction of the current in the outside circuit (lamp bank L) will then be in the same direction, although the current in the loop will be reversed twice for every revolution. When the side of the coil C_1 is in the position shown, current will be flowing in the direction of brush B_1 and current in side C_2 will be flowing away from brush B_2. With this arrangement brush B_1 is always positive (+) and B_2 is always negative (—). This is so because current in side marked C_2 will be reversed when it revolves 180° and assumes the position held by side C_1, thereby delivering positive current to B_1.

The curve for this single coil generator, representing the voltage at the brushes, will therefore remain above the horizontal (zero) line and indicate a pulsating unidirectional current in the lamps. This is effectively shown in Fig. 58a where the brush and split ring arrangement is shown to conform with the maximum and minimum voltage delivered. In Fig. 586 the emf for the single coil direct current generator is shown graphically. A pulsating direct current developed by a single coil generator is not suitable for plating or other commercial operations. To obtain a steady current, the number of coils, evenly distributed around the core (shaft) is increased. The commutator will, of course, be made up of a corresponding number of segments: that is, for 16 coils the commutor would be divided into 16 parts. In such manner the brush voltage may be made to be quite constant.

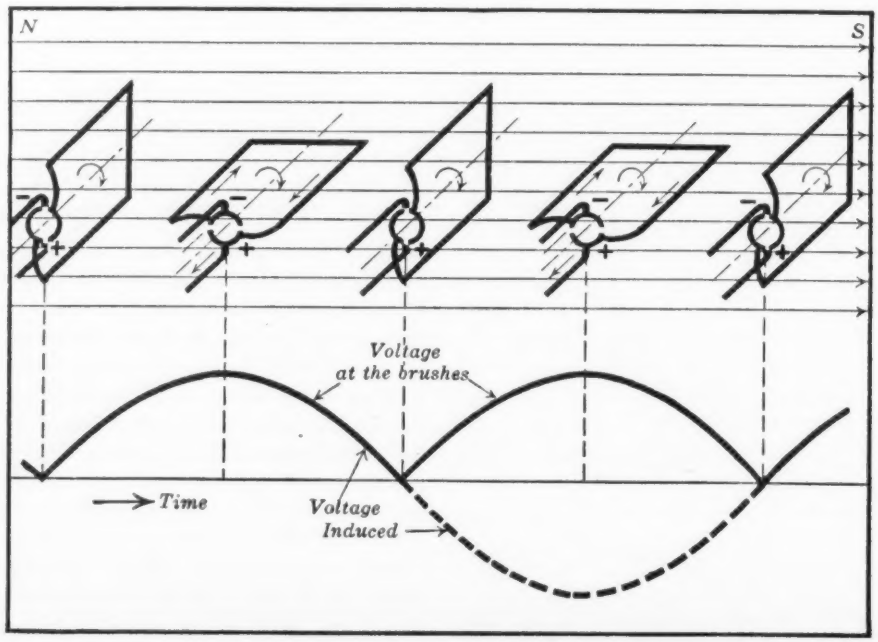


Fig. 58a. Curve showing pulsating e.m.f. delivered by loop with commutator.

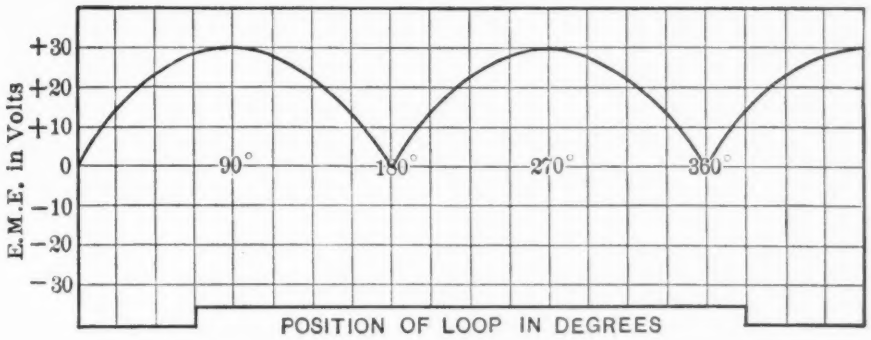


Fig. 58b. The e.m.f. wave form of a single-coil direct-current generator.

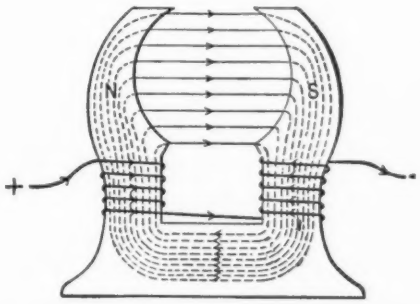


Fig. 59. The current in the coils produces the magnetic field.

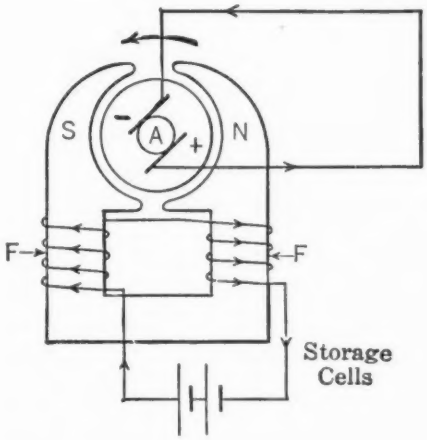


Fig. 60a. Separately excited generator.

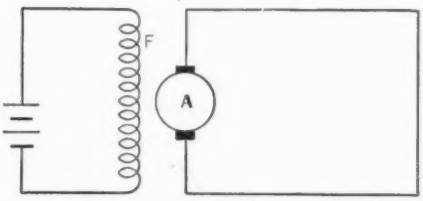


Fig. 60b. Conventional diagram for Fig. 60a.

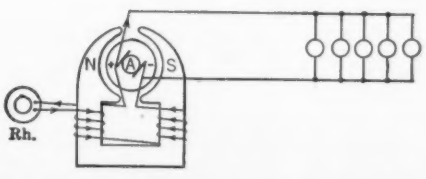


Fig. 61a. Shunt generator supplying incandescent lamps with current.

Field Excitation

When an electric current is sent through the coils wound around the soft iron or steel pole pieces of a generator, as shown in Fig. 59, a magnetic field is produced. Classification of generators is based upon the type of field excitations used. There are two methods for producing this effect.

When the field current is obtained from an outside source, like a storage battery or another d-c machine, it is known as a separately-excited generator. This type is suitable for low voltage generators (less than 50 volts) as well as for operations, as in plating, where the current must not change its direction. This is shown in Fig. 60a, where the complete unit is indicated, and in 60b, which is the conventional diagram for representing a separately-excited generator.

With the second type, the self-excited generators, the current for the field coils is obtained from the armature of the generator. When the field of the self-excited generator is connected in parallel with the main circuit, so that only a small part of the current delivered goes through the field (by using many turns of fine copper wire), this type of self-excitation is called shunt wound, Figs. 61a, 61b. This type is used to supply current for incandescent lamps or motors and for charging storage batteries. The voltage decreases with increase in load.

If all the current from the armature goes through the field coils (using a heavy wire with few turns) before it goes through the main line, then the field coils are placed in series with the circuit. The self-excited generator of this type is series-wound, Fig. 62. It

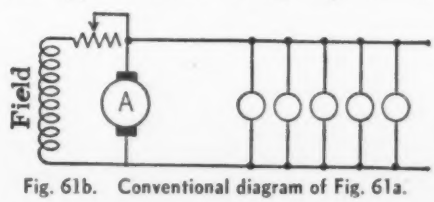


Fig. 61b. Conventional diagram of Fig. 61a.

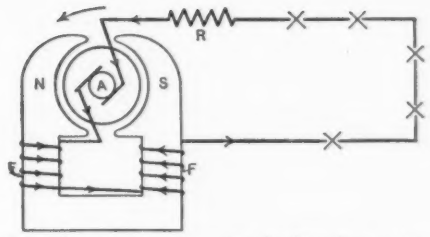


Fig. 62. A series generator feeding five series arc lamps.

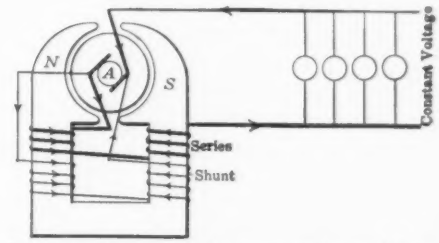


Fig. 63. Connections for compound-wound d-c generator.

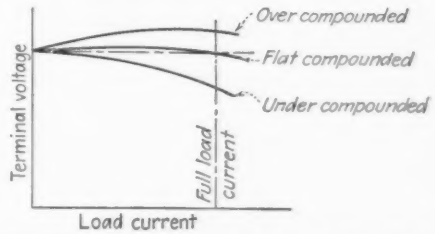


Fig. 64. External characteristics of compound generators.

is used where a constant current is required, as for arc lamps connected in series. The voltage in a series generator increases the increase in load.

A compound-wound self-excited generator utilizes the combined series and shunt methods of exciting the field coils. By having both sets of field coils wound on the same pole, the shunt coils shunted across the line and the series coil in series with the circuit, Fig. 63, the drop in voltage with increased load that occurs in a shunt-wound generator is made up by the series coil, which has just enough turns to compensate for this drop. When the voltage in a compound generator is the same at no load and full load, with a slight rise for a medium load, the generator is flat-compounded. When the series turns at full load are sufficient to give a higher voltage at full load than at no load, then the generator is said to be over-compounded. In a similar manner, when the full load terminal voltage is less than the no-load terminal voltage, the generator is under-compounded. Fig. 64 is a graphic representation of these external characteristics, that refer to the terminal voltage and load current. Because of its wide range of characteristics the compound generator is the most extensively used.

(To be continued)

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Barrel Plating Plastics

Question: I should like to get some information about barrel plating of copper on small parts, first silvered in a barrel by chemical reduction. How is it possible to barrel plate parts, when the density of these is lower than the electrolyte, that is, for polystyrene or almost all plastics?

P. G.

Answer: The most common method of barrel plating plastics which have a lower specific gravity than the acid copper plating solution is to keep the solution level below the parts so that their weight will hold the bottom parts down. The oblique plating barrels have been found most effective for this purpose.

Oxidize for Silver

Question: Several years ago I purchased a pound of green to yellow powder for oxidation of silver. This powder was mixed with muriatic acid and water, and was to be brushed on parts to be oxidized. I have now lost my source of supply, and wonder if you can help me to locate it. I don't know the trade name.

This powder came in one pound containers, and retailed for near $10 per pound, but it was extremely potent, and a small amount on the end of a knife blade would condition a ¼ pint of 50-50 water and muriatic acid.

Do you have any idea of who might make an oxidation powder fitting the above description? Can you tell me of any powder used in a similar manner; one that can be brushed on and immediately give a dark to black oxidized finish?

R. L. S.

Answer: The oxidizing solution referred to is based on tellurium chloride and can be prepared by dissolving 1 oz. of tellurium dioxide in 8 oz. each of muriatic acid and water, to form a stock solution. A list of suppliers of this type of compound is enclosed.

Tin-Zinc Bath

Question: We are interested in obtaining any available information regarding Alloy No. 9 (developed by International Tin Research Institute) which was mentioned on page 48 in your October, 1955 issue of METAL FINISHING.

W. S. P.

Answer: Alloy No. 9 is a deposit containing 80% tin and 20% zinc. A complete description of the process for producing this finish will be found in the section on Plating Tin-Zinc Alloys by Dr. F. A. Lowenheim, pp. 368-372 of the 1956 edition of the METAL FINISHING GUIDEBOOK.

Test for Chromate Film

Question: We have been asked to test cadmium plated parts, plated to specification QQ-P-416, type 2, class B, by checking as to whether or not the parts have been chromate treated. Our customer advises there is a solution (acid) used for this purpose that will indicate whether or not the parts have been chromated by showing a red color when the solution is dropped, or wiped on the plated surfaces. The solution is not supposed to damage the plating other than by showing the red color.

We have no information on such a test solution and will appreciate it if you will advise if there is such a test, or any other test to prove that parts have or have not been chromate treated. If possible, advise where necessary materials may be purchased.

R. W. S.

Answer: The test solution for presence of chromate conversion film on cadmium is prepared as follows:

Water	40 cc.
Glacial acetic acid	60 cc.
Diphenylcarbazide	1 g.
Wetting agent	0.1 g.
Hydrochloric acid	15 cc.
10-15% sodium hypochlorite	30 cc.
100 volume hydrogen peroxide	5 cc.

Add the ingredients in the above order and allow to age for 24 hours. A drop of the reagent applied to the surface will produce a red or purple color in about 1 minute if chromate film is present. The necessary ingredients may be obtained from any laboratory supply house.

Chemicals for Electroless Nickel Plating

Question: The article on "Electroless Nickel Deposition" in August 1955, pages 59-61, was very interesting. I would like very much to try this new way, but it is impossible to find certain chemicals such as palladium chloride and sodium hypophosphite. I would appreciate your advising me where I can obtain these products in the United States.

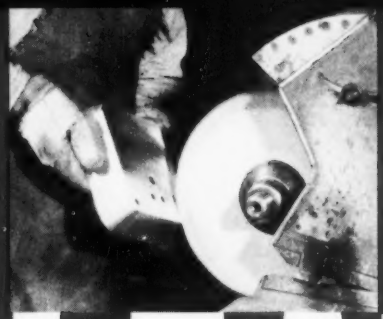
W. K.

Answer: Small quantities of palladium chloride and sodium hypophosphite are stocked by many large laboratory supply firms, such as Fisher Scientific Co. of New York.

Large lots of hypophosphite may be obtained from Oldbury Electro-Chemical Co., 19 Rector St., New York 6, N. Y., and palladium salts are sold by suppliers of precious metal plating solutions, a list of same appearing on page 563 of the 1956 edition of the METAL FINISHING GUIDEBOOK-DIRECTORY.

Colored Finishes on Aluminum

Question: Kindly advise the name of the manufacturer of the chemical



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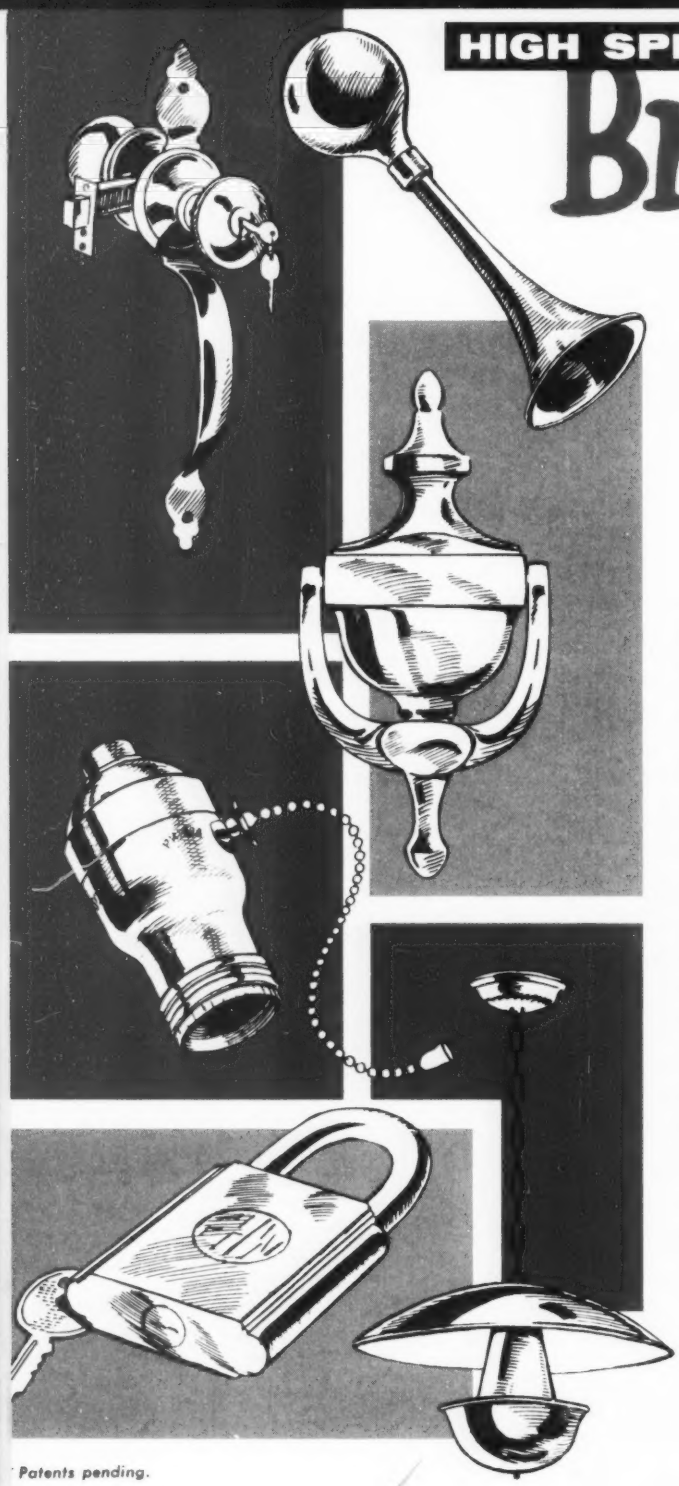

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that is put on aluminum drinking glasses, in different colors.

B. S.

Answer: The colored finishes produced on aluminum drinking glasses require an anodizing treatment, followed by dyeing and sealing. Information on the subject will be found in any recent edition of the METAL FINISHING GUIDEBOOK. The finishes can be applied by a number of job shops in your city and we would suggest that you check the classified telephone directory for their addresses.

Golden Brass Deposits

Question: We need a brass or bronze plating formulation and process that will give a golden brass with high luster on steel and on aluminum of the 11S type. We want to match in color solid brass of the free machining type used in automatic screw machine work. I am enclosing some samples of steel plates parts that show the desired color.

R. C. H.

Answer: The samples have the slight off-color brass deposit which is produced from a solution somewhat higher than usual in zinc concentration. It is suggested that small amounts of zinc cyanide be added to the standard brass plating formula, as given in any recent edition of the METAL FINISHING GUIDEBOOK until the desired color is obtained. However, control of the solution for consistent results may be difficult.

The high luster has been produced by tumbling in a barrel, which has flattened the peaks of the threads on the samples.

"Immunizing"

Question: We have an inquiry which calls for "Immunize Finish" to conform with Spec. No. 39630. Could you give us any information regarding this?

F. J. L.

Answer: "Immunizing" is a term generally employed for passivation of stainless steel. We do not have a record of specification No. 39630, but would advise that the precedure is to soak for about 20 minutes to 2 hours in a warm 20% by volume solution of nitric acid for the nickel-bearing 300 series alloys, and in the same solution with the addition of 2 oz./gal. sodium dichromate for the straight chromium, 400 series alloys.

Semi-Permeable Diaphragms

Question: Please advise if you can furnish any additional information on the following subject. In 1951 you published an article by *Walter R. Binai* on increasing silver content in silver cyanide solution by electrolytic regeneration. This was done by using a cell which consisted of a compartment fitted with cypress wood panels, which allowed current to pass through, but not silver ions. Silver is placed into solution from the anodes but does not pass through the cypress panels, therefore hydrogen is given off at the cathode.

Please advise if this type of set-up is suitable for production use. Has a membrane other than cypress wood or aluminum oxide pot ever been found which would be more suitable for a silver cyanide solution?

E. R. J.

Answer: Besides cypress panels and aluminum oxide glass mats and microporous rubber have been employed as semi-permeable diaphragms.

The cypress panels are quite suitable for production use in silver cyanide solutions. Since it is not necessary to use a large diaphragm for surrounding the cathode, a few laboratory sized aluminum oxide porous pots, which are obtainable from most laboratory supply firms, will be sufficient. A suitable catholyte will be a 16 oz./gal. solution of sodium or potassium cyanide. This solution can be returned to the plating bath after use.

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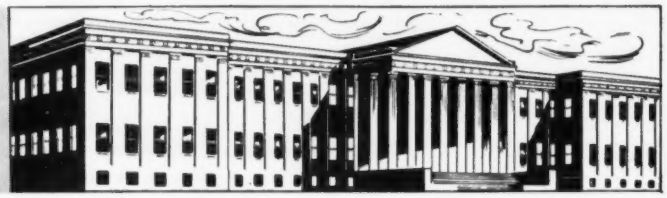

Bright Lead-Zinc Deposits

U. S. Patent 2,727,856. *Dec.* 20, 1955. *J. G. Beach, assignor to the United States of America.*

In the method of co-electrodepositing a bright lead-zinc alloy on a wire conductor and containing from 0.5% to 4% by weight of zinc and the balance lead, the steps comprising immersing the wire conductor to be coated in an electrolytic bath consisting essentially of an aqueous solution containing up to about 100 grams per liter of zinc cyanide, 75 to 100 grams per liter of sodium hydroxide, 35 to 40 grams per liter of sodium cyanide, 3 grams per liter of basic lead acetate, 25 to 30 grams per liter of potassium sodium tartrate, 4 to 6 grams per liter of sodium fluoride, about 3 grams per liter of gum arabic and 10 to 20 cubic centimeters per liter of a betaine; passing an electric current through the bath in such a manner that the wire conductor to be plated becomes a cathode; regulating the electric current to provide a current density of about 3 amperes per square foot; and heating the bath to a temperature of about 50°C.

Plating Rack

U. S. Patent 2,727,858. *Dec.* 20, 1955. *F. J. Klein, assignor to General Motors Corp.*

A fixture for holding a plurality of workpieces to be plated, said fixture consisting of an elongated container into which the workpieces are insertable and having a flat wall, said flat wall being provided with an elongated opening, said container having two parallel conductor bars mounted therein longitudinally thereof in fixed relative positions parallel to said wall of the container at least one of which includes means for connecting the bar to a source of plating current and upon which workpieces are placed in contiguous alignment, one of said bars being rotatable on its own longitudinal axis and having radially eccentric means extending longitudinally thereof engageable with the workpieces on the bars upon rotation of said one bar in one direction to move the workpieces thereby against the other of said bars and thereby move the workpieces against the said container wall and clamp the same in position against the container wall as retained by said other bar and the eccentric means on the said one bar, a spring operably connected with said one bar yieldably urging the same rotatively in the said one direction to effect the said movements of the workpieces supported on the said bars, and lever means connected to the said one bar oppositely to the rotative effect of the spring upon the said one bar.

Apparatus for Inspecting Tin Plate

U. S. Patent 2,728,262. *Dec.* 27, 1955. *W. J. Van Wye, assignor to Republic Steel Corp.*

In an apparatus for visually inspecting opposite surfaces of a plated metal strip or the like from a single inspection station, where the inspector's normal line of vision is above the upper side of the strip, a comparison plate of a predetermined standard brightness similar to plated metal strip having a contrasting line thereon similar to defective or non-plated strip supported below the underside of the strip, a light source for projecting light upon the underside of the plated surface of the strip and upon the surface of the comparison plate, said underside of said strip serving as an image receiving and projecting surface for said comparison plate and the reflection of the adjacent area of said underside of the strip, and a mirror also in the light adjustably supported to simultaneously receive the combined images of the underside of the plated strip and the image of the comparison plate to permit visual comparison by the inspector alternately of the directly visible upper side of the plated strip and of the said mirror reflected combined adjacent images, to thereby compare the strip surfaces with the comparison plate to detect flaws in the respective upper and lower plated strip surfaces.

Gas Plating

U. S. Patent 2,728,321. *Dec.* 27, 1955. *O. F. Davis and H. G. Belitz, assignors to The Commonwealth Engineering Co. of Ohio.*

Apparatus for plating objects by gaseous metal deposition said apparatus comprising an airtight chamber, a liquid atomizing means disposed in said chamber, said means including a nozzle comprising a tubular member through which liquid to be atomized is introduced into said chamber, said tubular member being surrounded by an outer end for discharging gas to propel a fine spray of liquid metal carbonyl into said chamber, means for supporting materials in said chamber and spaced from said nozzle for positioning material to be plated, means for heating said material which is arranged adjacent said material support and remote from said nozzle, an inlet to said chamber for introducing inert gas and disposed at one end thereof, an outlet from said chamber for removing inert gas and decomposition products from the chamber disposed at the opposite end thereof, and blower means connected with said inlet for circulating inert gas through said chamber and at a pressure above atmospheric.

Corrosion Prevention

U. S. Patent 2,728,695. *Dec.* 27, 1955. *J. R. Harrison, assignor to E. I. du Pont de Nemours & Co.*

The method of protecting a ferrous metal such as cast iron, steel or the like against corrosion which comprises contacting said metal successively with a first solution containing a reducing agent selected from the group

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consisting of alkali and alkaline earth metal thiocyanates and 8-hydroxyquinoline and then with a second solution containing an alkali metal ferrate.

Coloring Steel

U. S. Patent 2,728,696. *Dec.* 27, 1955. *F. Singer*

The process for producing a uniform, smooth, bright, and strongly adherent coating consisting mainly of hydrated ferric oxide on the surface of iron and steel articles, and other articles having a ferrous surface, which comprises providing said surface with a film of an aqueous solution of a chemical of the class consisting of acids and acid-reacting salts, said solution having a free acid content equivalent to about 0.2% to 3% hydrochloric acid, drying said film on said surface, and subjecting the filmed surface in dry form to the action of air having a relative humidity such as to cause the reaction to go to the ferric oxide stage, until the surface is uniformly covered with a red-brown coating consisting mainly of hydrated ferric oxide which is firmly bonded to said surface.

Electroforming with Aluminum

U. S. Patent 2,728,718. *Dec.* 27, 1955. *W. C. Schickner, assignor to The Battelle Development Corp.*

The method of electroforming an aluminum article which comprises the steps of forming an electrically conductive base in a desired configuration, immersing said article in a bath, said bath comprising a solution of a liquid aromatic hydrocarbon solvent in which is dissolved a fusion of an aluminum halide and a quaternary salt of nitrogen, said solvent being present in sufficient quantity to form a layer of excess solvent, continuously dispersing said excess solvent throughout the bath, passing an electric current between an aluminum anode and said conductive base as a cathode until an aluminum coating is deposited thereon, removing said coated base from the bath, and separating said conductive base from said aluminum coating.

Plating on Magnesium

U. S. Patent 2,728,720. *Dec.* 27, 1955. *H. K. De Long, assignor to The Dow Chemical Co.*

The method of producing soft ductile electroplates of nickel on articles of magnesium and the magnesium-base alloys which comprises subjecting the articles to the defilming action of a dilute acidulated aqueous solution of a fluoride selected from the group consisting of hydrogen fluoride, ammonium bifluoride, sodium bifluoride, potassium bifluoride, rinsing the defilmed articles in water, and without drying the rinsed articles electrolyzing the articles as cathodes in an electroplating bath consisting of an aqueous solution containing nickel bifluoride and hydrogen fluoride, said solution having a pH of 1 to 3 and containing per liter of the solution 10 to 50 grams of an organic polybasic acid compound selected from the group consisting of citric acid, tartaric acid, and the alkali earth metal salts of these acids.

Gas Plating Hollow Objects

U. S. Patent 2,729,190. *Jan.* 3, 1956. *P. Pawlyk, assignor to the United States of America.*

In apparatus for gas plating, the structure comprising opposed end flanges adapted to support a tubular object therebetween, said flanges being provided with bores, means to heat said object, a long multi-apertured tubular member having opposed ends extending through said bores, said flanges being rotatably supported on said tubular member, and a support extending from one said flange toward the other, said support surrounding a portion of said tubular member and slidingly engaging the same along a portion of the length thereof, and means to rotate said hollow cylinder and flanges about said tubular member.

Bright Dip for Aluminum

U. S. Patent 2,729,551. *Jan.* 3, 1956. *C. C. Cohn, assignor to Samuel L. Cohn and Charles C. Cohn.*

The method of treating a surface of aluminum or an aluminum alloy comprising subjecting said surface to the action of an acidic mixture having a solvent action on said surface to produce a macroscopically uniform smooth finish, said mixture including as its essential constituents approximately 45% to 98% of free phosphoric acid, approximately 2% to 35% of water, and approximately ½% to 50% of free nitric acid, said action taking place at a temperature in the range from 150°F. to the boiling point of said mixture.

Welded Nickel Anode

U. S. Patent 2,729,580. *Jan.* 3, 1956. *W. L. Pinner and O. D. Hoxie, assignors to Houdaille-Hershey Corp.*

The method of making a composite welded anode which comprises welding together metal sheets to form an anode wherein both the weld metal and the metal sheets are electrolytic nickel, and then subjecting the welded anode to heat treatment within the range of 1,400° to 2,100°F. for a sufficient period of time to effect a substantially equalized grain growth of the nickel in said anode in and around the weld and to decrease corrodibility of the weld.

Cleaning Compound Testing Apparatus

U. S. Patent 2,729,098. *Jan.* 3, 1956. *W. E. MacKenzie and S. A. Matsuka.*

Apparatus for determining the effectiveness of a cleaning solution comprising an elongated trough; an element having a flat circular surface positioned above one extremity of the trough; a standard soil which is substantially uniformly deposited on the said surface; means for rotating the element at a predetermined rate on an axis which is substantially at right angles with the center of the said surface; a hood-like device which extends upwardly from the trough and which encloses all but the said surface of the element; a spray-forming device positioned in front of the said surface of the element; means for supplying the spray-forming device with controlled amounts of a pressurized fluid and the said cleaning solution; and means for automatically reciprocating the spray-forming device to and fro across the said surface.

Electroplating on Beryllium

U. S. Patent 2,729,601. *Jan.* 3, 1956. *J. G. Beach and C. L. Faust, assignors to the United States of America.*

In a method of electroplating a beryllium body including the steps of passing an electric current through the beryllium body as an anode in an aqueous solution of phosphoric acid and hydrochloric acid, rinsing the beryllium body with water, and electroplating a metal on a surface of the body, the improvement comprising immersing the beryllium body in 70% nitric acid for two minutes at a temperature from 70° to 90°F. after said

anodic treatment and before the water rinse.

Bright Acid Zinc Bath

U. S. Patent 2,729,602. *Jan.* 3, 1956. *G. R. Van Houten.*

The process of producing bright zinc plate which comprises providing an anode and a cathode in an acid zinc solution containing an additive selected from the group consisting of selenium, the oxides, acids and acid salts of selenium and tellurium, and the sulfur homologs of the oxides, acids and acid salts of selenium and tellurium such as to maintain the effective concentration of the metal of the selected additive between 0.01 mg. and 20 mg. per liter of solution, and passing an electric current between said anode and cathode thereby causing the deposition of bright zinc plate on said cathode.

Method of Increasing the Scaling Resistance of Metallic Objects

U. S. Patent 2,730,458. *Jan.* 10, 1956. *H. Schulze, assignor to Vereinigte Deutsche Metallwerke Aktiengesellschaft.*

A method of improving the scaling resistance at temperatures above 800° C. in the presence of corrosive gases of a metal article coated with a scaling resistant chromium-and-nickel containing alloy which comprises applying to such coated metal article a coating of a bituminous paint containing a material selected from the group consisting of $CaSi_2$ and Al_2Ca.

Blast Cleaning Apparatus

U. S. Patent 2,729,918. *Jan.* 10, 1956. *W. N. Van Denburgh.*

Blast apparatus for use on vertically inclined surfaces, the apparatus including a cabinet provided with an open end and with a discharge opening, means for suspending said cabinet in a freely-swinging position with its open end adjacent the surface to be worked, a blast nozzle projecting into said cabinet toward said open end, pressure - reducing means operative during blasting for creating a differential pressure within the cabinet capable of moving blast products outwardly through said discharge opening, and compressibly-resilient means extending outwardly from said open end for engaging the surface to be worked, said suspension means includ-

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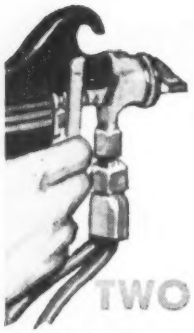

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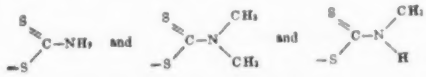
ing a trolley assembly adapted to be detachably supported above said surface, a cable suspending said cabinet from said trolley assembly, means for driving said trolley horizontally of said surface, and means for adjusting said cable length whereby said cabinet is movable horizontally and vertically with respect to said surface for positioning the cabinet over all surface areas, resilient means whereby said blast products are contained and said differential pressure discharge is accomplished.

Copper-Zinc Bath

U. S. Patent 2,730,492. *Jan.* 10, 1956. *A. E. Chester, assignor to Poor & Co.*

A plating bath comprising an alkaline zinc copper cyanide bath containing in solution a bath soluble dithiocarbamate having a radical from the group consisting of



the quantity of said dithiocarbamate being sufficient to extend the usable range of current densities at which alloys of zinc and copper can be electrodeposited from said bath.

Zinc Plating Magnesium

U. S. Patent 2,730,490. *Jan.* 10, 1956. *R. T. Hendrich and D. L. O'Brien, Jr., assignors to The Wire Coating and Mfg. Co.*

The process of making a bi-metal plate consisting of a magnesium base plate having a surface coated with a smooth thin continuous adherent coating of zinc which comprises chemically depositing a superficial uniformly discontinuous layer of zinc onto the thoroughly cleaned surface of a magnesium plate by contacting said cleaned surface with an aqueous alkaline solution comprising zinc ions having ion exchange with the magnesium plate and then directly upon such chemically deposited zinc, electrodepositing from a cyanide bath a continuous layer of zinc having a thickness of not over about .0008 inch.

Cobalt-Nickel Bath

U. S. Patent 2,730,491. *Jan.* 10. 1956. *W. E. Moline and R. M. Clinehens, assignors to The National Cash Register Co.*

The process of electroplating a base metal with a nickel-cobalt composition including the steps of preparing an electrolyte consisting of an aqueous vehicle in which has been dissolved nickel and cobalt salts so that the nickel content is from 10 to 75 grams per liter of solution and the cobalt content is from 25 to 75 grams per liter of solution and in which has been dissolved between 1 and 3 grams of a toluene sulfonamide per liter of solution, said toluene sulfonamide being taken from the group consisting of ortho-toluene sulfonamide and paratoluene sulfonamide, and boric acid in the amount of 5 to 45.0 grams per liter of solution; introducing the base metal into said electrolyte as the cathode; introducing an anode into the electrolyte; and passing, from an alternating current source, an alternating current between the electrodes, the connection from one electrode to the alternating current source being a direct connection, and the connection from the other electrode to the alternating current source being divided into two parallel branches, one branch containing a first half-wave rectifier and a first impedance and the other branch containing a second half-wave rectifier oriented electrically to pass current in a direction opposite to that of the first rectifier and also containing a second impedance of a value different from the first so that there is a plating phase and a deplating phase, said impedances being so selected that the average plating current density is less than 10 and more than

one times the average deplating current density.

Electrolytic Deburring

U. S. Patent 2,730,494. *Jan.* 10, 1956. *M. H. Bennert, assignor to General Motors Corp.*

The method of removing a burr from a ferrous metal member containing carbon and forming a clean, bright surface thereon which comprises immersing at least the portion of the member having the burr thereon in a first solution consisting of approximately 2 to 60 per cent by volume of commercially concentrated hydrochloric acid (specific gravity 1.19) and the balance water, passing direct current through said first solution with the member as anode until the burr has been removed, and a dark smudge left on the member, thereafter placing at least that portion of the member having the dark smudge thereon in a second solution of the class consisting of (a) 20 to 95 parts by volume of commercially concentrated phosphoric acid (85% acid), 2 to 10 parts by volume of commercially concentrated hydrochloric acid (specific gravity 1.19) and 5 to 20 parts of water and (b) 20 to 95 parts by volume of commercially concentrated phosphoric acid (85% acid) and 5 to 20 parts by volume of water, and passing direct current through the second solution with the member as anode until the dark smudge resulting from treatment in the first solution is removed.

Vacuum Metallizing

U. S. Patent 2,730,986. *Jan.* 17, 1956. *P. W. Patton, assignor to National Research Corp.*

An improvement in a source of aluminum vapors for an apparatus wherein an article is coated with aluminum by evaporation of said aluminum in a vacuum and condensation of the aluminum vapors on the article, the improvement comprising an elongated carbon rod for supporting molten aluminum within an evacuated chamber, a surface stratum of a carbide of one of the metals molybdenum and tungsten on said elongated carbon rod, a hollow refractory support for receiving each end of said carbon rod, at least a portion of each said support forming a high conductivity electrical path, a metal powder filling said hollow support to serve as a low resistance path for heating current passing between each end of said carbon rod and the high conductivity portion of each support, and flexible conductors for predeterminedly positioning said supports and rod within said evacuated chamber.

Method for Threading Strip Through a Continuous Strip Processing Line

U. S. Patent 2,731,262. *Jan.* 17, 1956. *H. C. Morrow, assignor to United States Steel Corp.*

The method of fastening together broken ends of a strip passing through a tank having a liquid therein in a plurality of vertical passes around spaced apart upper rolls having at least the upper part thereof located above the liquid in said tank and spaced apart lower rolls located at the bottom of said tank with a reversible chain following the path of the strip through the tank on each side of said strip: which method comprises feeding that part of the strip in the exit end of the tank toward the exit end of the tank until the broken end is adjacent one of the rolls above the liquid level, pulling that part of the strip in the entry end of the tank backwardly toward the entry end of the tank until the broken end is adjacent one of the rolls above the liquid level, fastening the last named end of the strip to the chains, moving the chains with the

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attached strip toward the exit end of the tank until the last named end of the strip is adjacent the first named end, and then fastening the ends of the strip together.

Volatile Corrosion Inhibitor

U. S. Patent 2,731,324. *Jan.* 17, 1956. *L. W. Kalinowski, assignor to Sinclair Refining Co.*

An article of manufacture which is useful in the packaging of metal objects in order to prevent their corrosion, said article being a material to which has been applied a vapor phase corrosion inhibiting composition consisting essentially of a non-volatile heavy hydrocarbon vehicle and about 3 per cent to 10 per cent by weight based on the total composition of an alkanoyloxyacetic acid having from 8 to 12 carbon atoms in the alkanoyl group.

ABSTRACTS

Silicone Polishing Compounds

F. Ohl: *Metalloberflaeche.* Vol. 9, No. 6, pp. 93A-95A.

The production of the various polishing compounds are limited to a few raw material groups. These are oils, greases, waxes, and resins plus the mineral substances which have an abrasive action. Practical experience shows that the function of a polishing compound depends not only on the raw material itself but also on its characteristics. There are however an infinite number of possible variations here which cannot always be precisely fixed by physical data. With the solvents used, experience again shows that only a precisely balanced, azotropic solvent mixture is able to influence favorably the polishing effect as regards brightening action and still more so as regards work speeding-up.

The methyl silicone oils, which are suitable for the production of polishing pastes, are prepared with varying degrees of polymerization. Apart from the silicone oils, silicone oil emulsions are also used. The significant characteristics of the silicones for application to polishing compounds lie in their wetting characteristics, in their brilliancy-imparting characteristics as well as in the stability of the polish together with its water-repellancy. Two types of silicone polishes can be distinguished—i.e. polishes in which the silicone forms the chief constituent and polishes in which silicones are added.

Experience has shown that silicone-containing polishes with the finest application — best a spray application— give a high polish and a durable protective action. The actual polishing work required is also considerably facilitated and reduced. Frequently, oils are often added to the compositions. Experience has shown, however, that the action of the silicone is lost if too much oil is added; this applies particularly to polishes which contain only a small amount of silicones. In such cases the addition of waxes has always proved more advantageous.

Rhodium Plating

Galvano (Paris). Vol. 24, No. 218, pp. 19-21.

In general, the phosphate rhodium plating solutions have a lower cathode efficiency than the sulfate baths. The mixed solutions are located between the two. The cathode efficiency increases considerably with temperature; it is more than doubled when the temperature goes, for example, from 20 to 30°C. The temperature of the bath must, accordingly, be closely supervised, within ± 2°C. so as to control the thickness of the expensive rhodium coating applied even when the plating is being conducted at room temperature because, without this, the same bath would deposit more than twice as much metal in summer as in winter.

For thick deposits of rhodium, up to 12.7 microns, the coatings are normally obtained from more concentrated solutions containing 10 to 20 g. of rhodium per liter. It is thus possible to obtain deposits up to 25 microns from the sulfate solution.

The action of impurities is very important with rhodium plating. These impurities enter into the rhodium solution with the water or by attack of the acid solution on the base metal before the treatment. Contamination of the rhodium plate by traces of foreign metals can lead to great variations in color of the deposit. Copper, zinc and tin are particularly objectionable impurities, strongly diminishing the reflective power of the coating. However, the solution tolerates small quantities of iron and nickel. The bath should be prepared with distilled or completely softened water to exclude calcium.

For normal purposes, the rhodium is generally plated on a sub-coating of nickel or silver. On silver the rhodium should have a thickness of 0.25 to 0.5 microns to give suitable protection against tarnishing. As nickel is less susceptible to tarnishing than silver, a lesser thickness of rhodium can be used of the order of 0.125 to 0.25 microns; the sub-nickel should be from a bright nickel bath and a nickel cobalt bath is often preferred rather than a bath with organic brighteners.

Electron Microscopic Investigation of Electroplated Nickel Deposits

K. M. Gorbunova and N. A. Shishakov: *Izvest. Akad. Nauk*, U.S.S.R., *Ser. Fiz.* Vol. 17, pp. 242-245.

In nickel plated deposits there exist two groups of crystals which are independent of each other, of which each possesses its own orientation. For example, in the base layer of the coating, hexagonal crystals can be present and, with further growth, cubic structure can result. The presence of hydrogen in the base coating is apparent. By gradual release of the hydrogen, with the subsequent disturbance, the re-orientation of the crystals is caused.

Electroless Nickel Plating

Dr. Bosdorf: *Mitteilungen Forsch. Ges. Blechverarbeitung.* No. 5, pp. 59-60 (1955).

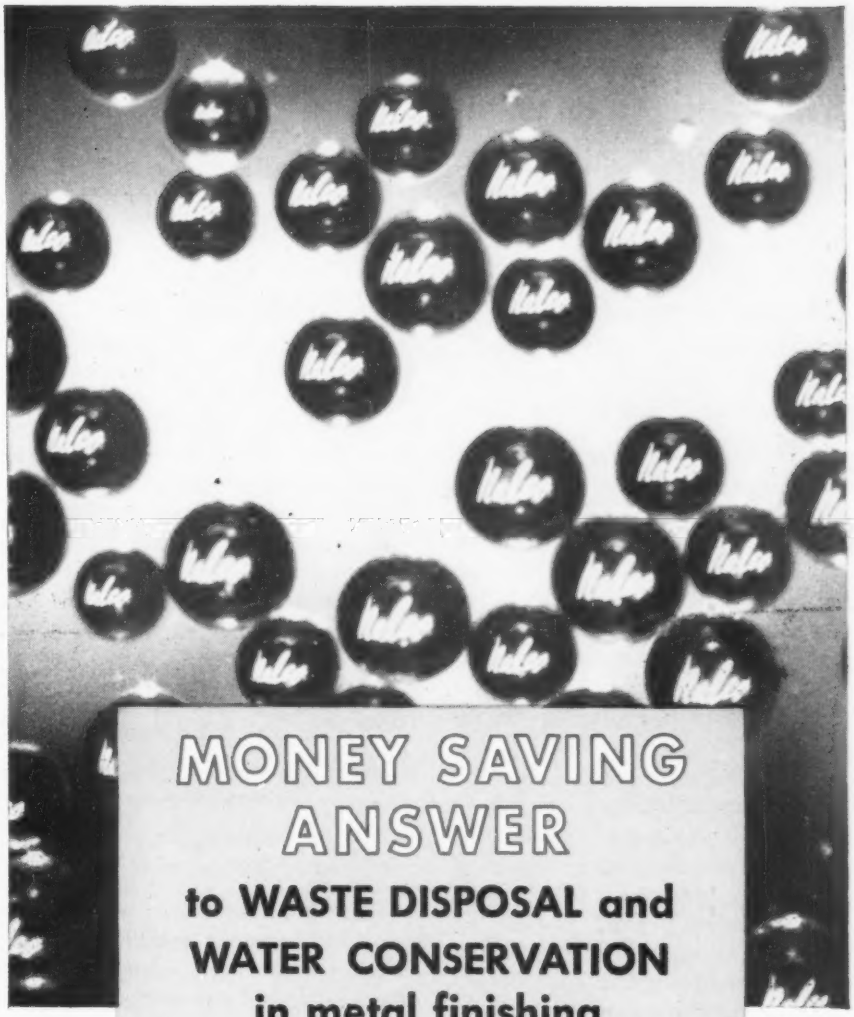
The electroless nickel coating process, as is known, is based on the strong reducing action of phosphorous acid. Details are given of the bath conditions for best operation. The acid bath works with a pH value of 5.5 and the alkaline bath with a pH value of 10.5. In one hour in an acid bath there is obtained a coating thickness of 12 to 15 microns and in an alkaline bath, up to 5 microns. The nickel coating from an acid bath is dull and gray but has a bright appearance when deposited from an alkaline bath. The working temperature is 90 to 95°C.

With a rising nickel content of the bath, the thickness of the chemically reduced nickel coating increases and the maximum bath composition lies at 20 to 25 g./l. The most favorable amount of sodium hypophosphite to use in the bath is 20 to 25 g./l. A part of the nickel is reduced in the form of nickel spangles, even when no metal is present in the bath. After 3 hours in a 3 liter bath it was found that 2.3 g. nickel in the form of spangles had been reduced.

Through the hydrogen ions which are formed, the pH value of the bath falls correspondingly. This can ultimately lead to resolution of the reduced nickel deposit. Buffering salts are accordingly added in the case of acid baths, sodium acetate being employed, so that the pH value remains at 4-6. The nickel deposits which are produced with these reducing baths are harder than the normel electrodeposited nickel plate. The hardness is 450-500 Vickers.

With the exception of cadmium, lead, zinc, bismuth, and manganese, all the metals can be nickeled without current in this way. With some metals, a contact innoculation is necessary, in order to initiate the reaction. The nickel deposit obtained is pore-free and dense, and a certain smoothing effect is achieved. Largely because of the non-porous nature of the deposit, the corrosion protection is higher than with normal nickel plate and the deposit can also be applied for the nickel coating of parts subjected to wear. The plating is of special advantage for application to the internal nickel coating of strongly profiled parts. The pretreatment of the parts is the same as with normal electroplating of nickel. As mentioned above, as the nickel also separates out in the form of spangles, frequent filtration of the bath is necessary. Regeneration of the bath is possible but only to be recommended for large baths. Smaller baths up to 50 liters are worked to exhaustion.

Either vitreous enameled containers or tanks lined with a temperature resistant polyethylene can be used. Heating can be either direct or by immersion heaters. Small parts can be nickel coated either in a barrel or a drum unit. The nickeled parts can be polished by mechanical means and can also be electropolished.



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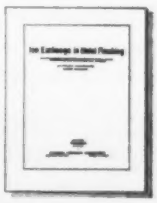

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Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES

Chromium Plating Additive

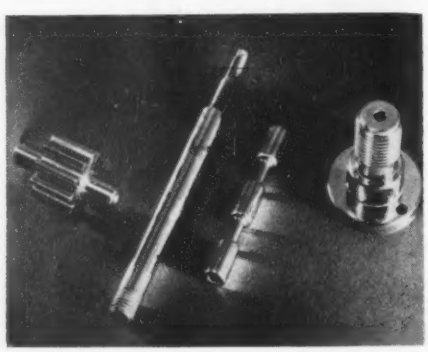
Diamond Alkali Co., Chromium Chemicals Div., Dept. MF, 300 Union Commerce Bldg., Cleveland 14, O.

CPA 1300 is a new catalyst, designed for both decorative and hard-chrome plating applications. In replacing a portion of the sulfate used in conventional chromeplating solutions, the material is reported to speed-up and simtional chrome plating solutions, the mamaterial, consumed only through dragout, is said to provide a number of cost-saving, quality-improving advantages.

Principal benefits provided by the use of this new additive, the above manufacturer says, include faster plating, broader operating range of plating solution, and greater covering power. It is also claimed to make possible the electrodeposition of brighter and harder chromium coatings, to simplify anoding in hard-chromium applications, and to improve the metallurgical characteristics of chromium plate.

Faster chromium plating is achieved, it is said, through an increase in cathode current efficiency and the use of higher current densities. Bright deposits are obtained over a broad temperature range.

Parts of widely varied shape, size and weight, particularly those of complex design and with intricate recesses, are also said to be plated more easily due to greater covering power of baths incorporating this additive. Typical examples of work already being chromeplated with the catalyst solution are shown in the accompanying photo.



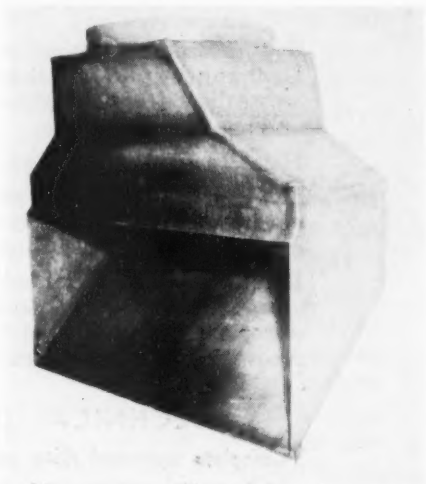
In hard-chromium plating, it is further claimed that brighter and harder deposits can be produced with this new development, thereby eliminating most grinding and buffing operations previously required in many instances. Hardness of chromium deposited is further reflected by increased service life under extreme wear conditions.

The material is packaged in 5-lb. cans, four to the case, for ease of handling and storage convenience. It is available from a select group of distributors.

Light Weight Corrosion Resistant Fume Hoods

Haveg Industries, Inc., Dept. MF, 900 Greenbank Road, Wilmington, Del.

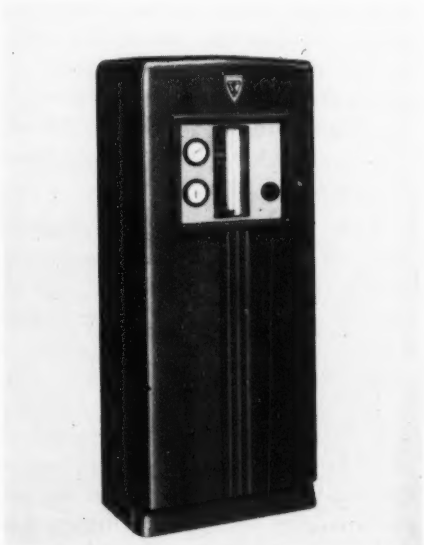
This light weight corrosion resistant fume hood recently introduced by the above manufacturer, is one of a large line of standard and custom built corrosion resistant hoods, fume ducts and



stacks made of polyester glass plastic. Among the advantages claimed for this material are light weight, high impact strength and a very high corrosion resistance to hydrochloric acid and other fumes normally corrosive to other materials. The ease of field fabrication, both for initial construction and possible changes, makes the polyester resin glass reinforced hoods especially suitable for industrial fume removal applications. It is claimed that both initial material cost and installation and maintenance cost are substantially lower than for materials that will offer comparable corrosion resistance.

Chlorinators

Wallace & Tiernan Inc., Dept. MF, 25 Main St., Belleville 9, N. J.

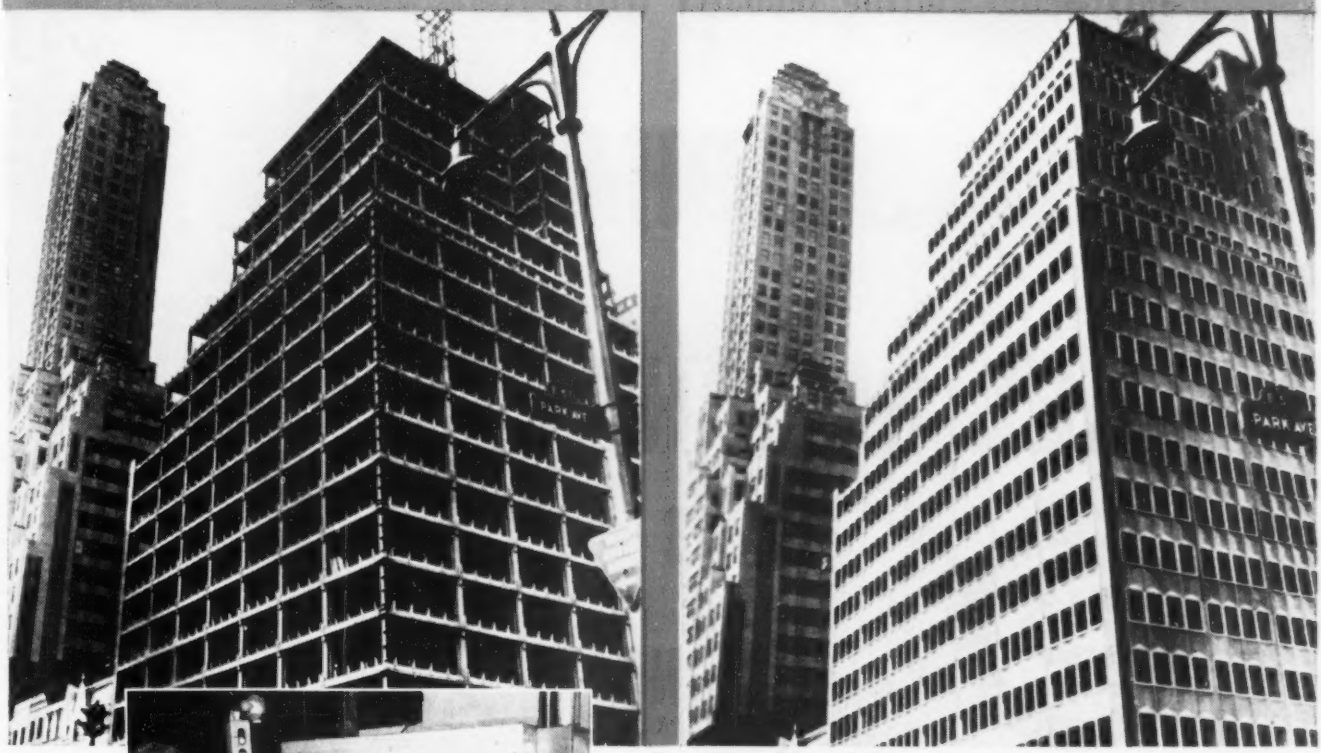


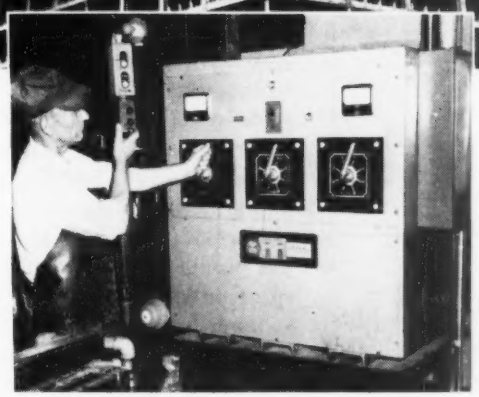
The introduction of the first two models of the V-notch line of chlorinators has been announced by the above manufacturer. The chlorinators, built entirely with corrosion resistant materials, feature a new metering and controlling principle — the V-notch variable-orifice.

The chlorinators cover a feed range from 25 pounds per day to 2,000 pounds per 24 hours. The Series A-712 Wide Range Model features direct reading dial indication of the feed rate with $\pm$ 4% accuracy over a 20 to 1 range for any V-notch variable-orifice. The Series A-711 chlorinator provides a rotameter for feed rate indication, giving accuracy over a 10 to 1 range for any one rotameter.

V-notch variable-orifice control gives precise and smooth chlorine feed control over an extremely wide range. The new chlorinators are styled with an attractive, two-tone green fiber glass cabinet.

Curtain Going Up!





The Marion Davies Building, New York, was completely enclosed in *10 hours*—through the miracle of anodized aluminum "curtain" walls. Giant two-story panels are manufactured by General Bronze Corp., using an **H-VW-M AUTOMATIC ANODIZING SYSTEM.**

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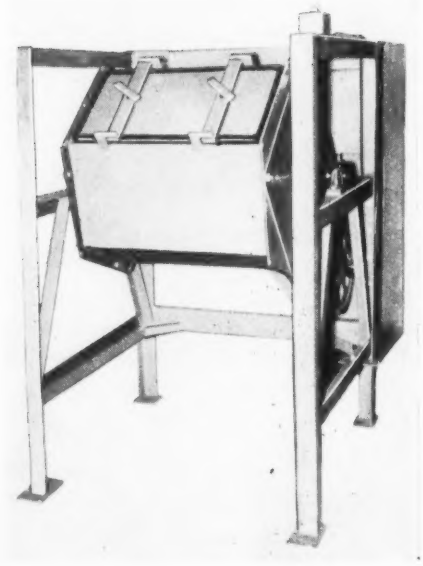


The barrels can be unlined or lined with No-seam vinyl plastic for extreme wear and chemical resistance.

Temporary Anti-Rust Compound

International Chem. Co., Dept. MF, 2628 N. Mascher St., Philadelphia 33, Pa.

Parts that must be stored temporarily can be rust proofed effectively and at low cost with an anti-rust compound called NoRuSol. This water soluble compound is said to protect parts so that they can be stored indoors for 30 or more days under normal plant conditions.

According to the manufacturer, in recent tests coated parts showed no evidence of rust after 400 hours exposure in a humidity cabinet with the temperature at 100°F. and relative humidity of 100%.

Normally used as a 3% solution, the product can be applied either by spraying or by dipping parts in the solution heated to 130°F. This protective film can be left on work for most subsequent operations. But, in the few cases where it is necessary to have a chemically clean surface, the compound can be easily removed with a mild cleaning solution.

Non-Flammable Solvent

Harry Miller Corp., Dept. MF, 4th and Bristol Sts., Philadelphia 40, Pa.

Immunol is a neutral, non-toxic, non-flammable solvent that cleans, degreases and rustproofs all metal surfaces safely and effectively in one operation. The inexpensive product is harmless and can be applied by any method now in common use to clean

New Compound for Barrel Deburring

Oakite Products, Inc., Dept. MF, 154 Rector St., New York 6, N. Y.

Oakite FM 183, an alkaline material designed for the barrel deburring of small parts, is the newest addition to the firm's line of barrel finishing materials. The product combines a fine, fast-cutting abrasive with surface active agents designed to keep media bright and sharp. Its use, alone or with stones, is said to save time and cut costs, and in many cases to eliminate individual handling of parts, hand filing and abrasive-belt operations. Used in concentrations of 1 to 5 ounces per gallon of water, the compound is designed for the deburring of stamped or machined parts, grinding off sharp edges, removing tarnish, rust, and heat scale, improving surface finishes, and deburring steel and zinc.

Precision Barrel Finisher

Rampe Manufacturing Co., Dept. MF, 14915 Woodworth Ave., Cleveland, O.

Model V-4 has a versatile, hexagonal 4 cu. ft. tumbling barrel, 23" dia. x 21½" long, supported at each end and adequately powered for steel ball burnishing. Power is furnished by a ¾ H.P. 220/440 volt, 3-phase motor with either variable or fixed speed drive.

anything from small parts to heavy machinery. It is mixed with hot or cold tap water and is said to be superior to carbon tetrachloride, trichlorethylene, kerosene, mineral spirits, and gasoline, and it quickly carries off oils, soils or foreign matter, leaving a protective rustproof coating. Only a few ounces of the solvent per gallon of water are required to produce a gallon of solvent which can be used over again for many applications once the foreign matter has been removed. The product can be used in vapor degreasing units, for improving alkali cleaners, as a rust preventive, for the final rinse after plating, for tumbling operations, and for general plant housekeeping.

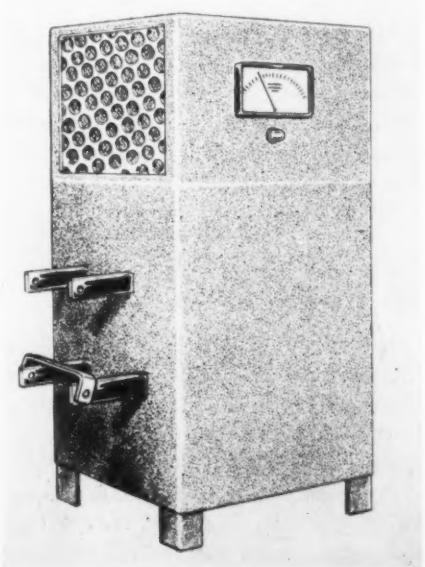
Fully-Protected Germanium Rectifier

Wagner Brothers, Inc., Dept. MF, 400 Midland, Detroit 3, Mich.

A new line of germanium electroplating rectifiers, fully-protected against circuit overloads, has been developed for the metal finishing industry. Utilizing the new General Electric germanium "Safety Cell," hermetically-sealed to protect the germanium wafer from the deteriorating effects of moisture and corrosive fumes, the rectifiers have permanent characteristics — will not age.

Basic stacks consist of six germanium cells, each with cooling fins. The stacks are of a standard design, are interchangeable, and are rated at approximately 500 amperes each.

Every germanium cell is individually protected against circuit fault conditions and sudden overloads by fast-acting "amp trap" fuses which break circuit in a fraction of a second, before irreparable damage can be done to the heat sensitive germanium junction.



All units are forced air cooled, being equipped with an extra-capacity centrifugal blower. The 3-phase blower motor is provided with a separate magnetic starter to guard against overloads. The unit is further protected from the build-up of destructive temperatures due to blower failure by a pressure switch.

In addition to individually-fused germanium cells, the rectifier is protected against single phasing on the 3-phase circuit. The main magnetic starter is provided with a thermal breaker for overloads.

Efficiencies as high as 95% are possible, depending upon current and voltage, and these units will operate indefinitely at up to 150% of rated current. A voltage range from 6 to 48 volts, with current output up to 50,000 amperes, will accommodate most metal finishing needs.

The new germanium rectifiers are provided with any popular type of automatic or manual control: tap switch, powerstat, remote saturable reactor, etc. These controls can be situated either integrally on the rectifier cabinet or as a remote control at any location within the plant.

The units are available in two basic cabinet sizes: 28" x 28" x 64" for up to 3,000 amperes, and 28" x 54" x 64" for units with capacities from 4,000 to 6,000 amperes.

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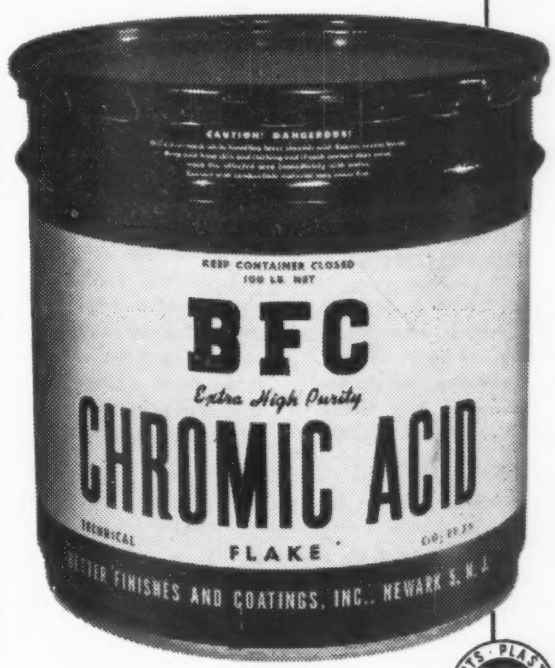
Every batch checked!

99.75% pure



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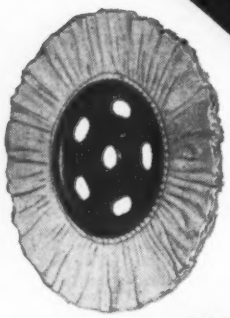

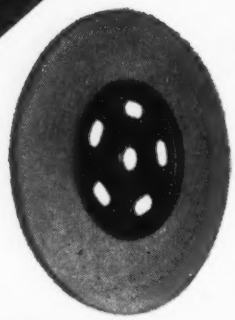

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These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

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"THE FOUR McALEERS"

Monel Degreasing Basket

Wiretex Mfg. Co. Inc., Dept. MF, 40 Mason St., Bridgeport 5, Conn.

A new basket made for use in degreasing is constructed of No. 16 gauge corrosion-resistant Monel metal throughout.

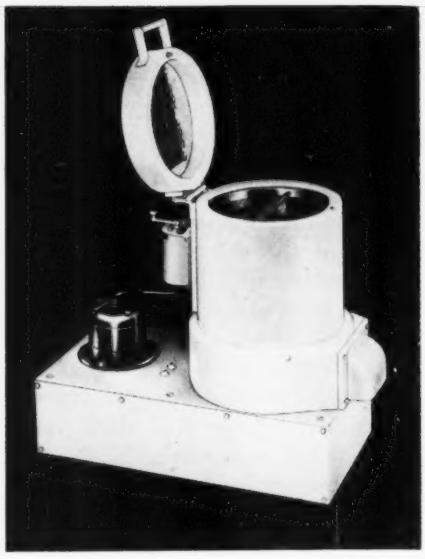
Size of the basket is 21½" x 13½" x 13½" deep. Sides and bottom are of ½" hole No. 16 gauge perforated Monel. The top and bottom frame is of 1" x ⅛" flat bar stock, while the corner braces are of 1" x 1" x ⅛" angle Monel. Handles at each end, made of ⅜" diameter rod, are shaped for quick, easy, comfortable gripping. To provide additional strength for handling of excessive loads, two braces of ⅜" diameter rod extend the length of the basket, supporting the outside frame. Three similar braces of ⅜" diameter rod are spaced 5⅜ across the width of the basket.

Centrifugal Dryer

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

A new Mercil belt-driven centrifugal dryer features sound engineering, simplicity of design, compactness, economical operation and important safety features.

Mounted on a heavy duty base, the new Model 56 dryer is driven by two standard V-belts which are powered by a totally enclosed ball bearing ½ h.p.



vertical flange mounted motor. This design prevents moisture from entering the motor. Dryer basket revolves at approximately 500 r.p.m. The dryer will handle work loads up to 70 pounds, depending on size and type of work being processed.

The dryer may be electrically heated, with a turntable furnished with a suction fan mounted to draw air down through the work from an opening in the cover, where an electric heating element is located. Heated dryers are furnished with red covers as a safety measure, to warn the user against touching a hot cover. Both heating elements and motor drive are automatically controlled by a heavy duty reversible switch.

The hinge on the cover is located at the back of the dryer and remains attached to the dryer shell when lifted. The outer shell of the dryer is designed to prevent particles of work from falling under the turntable, which might damage the drive shaft.

Maintenance of the dryer is simplified by a base side plate which is easily removed for accessibility. Optional equipment includes a clutch pulley on the motor shaft, which reduces wear and initial torque put on the motor.

Soak Cleaner

The Haviland Products Co., Dept. MF, Grand Rapids, Mich.

The Havasol O/SC-1 system is a combination of an organic liquid (Havasol O) and a balanced alkaline powder (SC-1) forming a soap soak cleaner in aqueous solution.

It is used primarily as a soak cleaner for removal or softening of buffing compounds from metals and is most

adaptable to cleaning before electrocleaning in plating cycles. Another use is as a protective film for metals during storage or shipment. It is not a serious contaminant to plating baths, and is not harmful to rack coatings; it is safe for personnel to work with.

Teflon Base Pipe Sealing Compound

Crane Packing Co., Dept. MF, 6400 Oakton St., Morton Grove, Ill.

A new chemically inert pipe joint compound, claimed to positively seal practically all known highly corrosive liquids and solvents, has been developed for services up to 212°F. Known as "John Crane" Chemlon pipe joint compound its base is DuPont Teflon. This material is not only impervious to all types of hard-to-handle fluids, but possesses an extremely low coefficient of friction. The latter substantially reduces wrench torque, permitting connections to be drawn up to a greater degree of tightness without undue stress or strain.

The non-adhesive quality of Teflon and the non-hardening characteristics of the compound allow the connections to be quickly and easily disassembled, even after years of severe service. The new pipe joint compound is particularly adaptable for use on aluminum, stainless, Monel or plastic pipe and is currently available in 2-oz. screw-type jars.

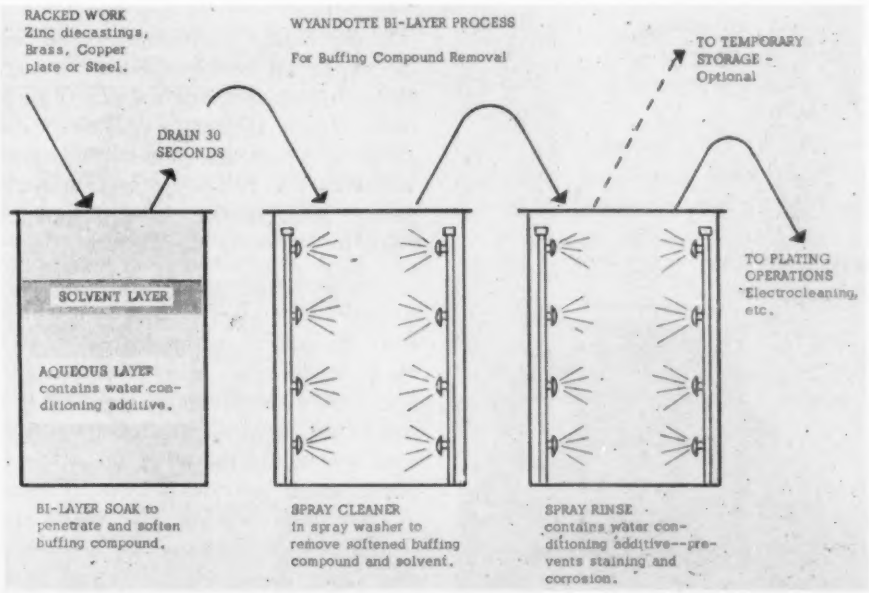
Precleaning Process for Buffed Metals

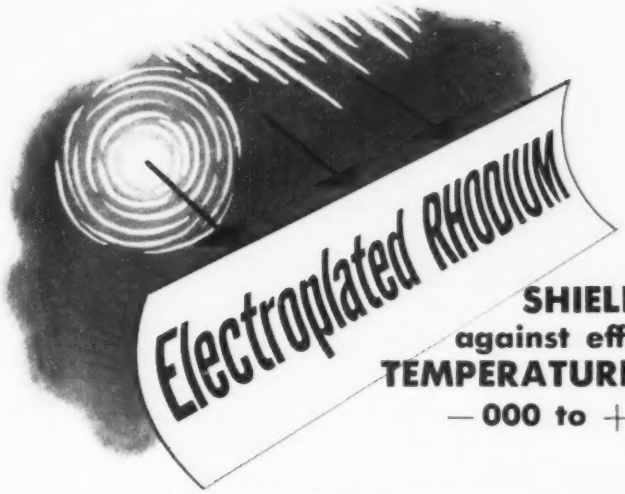
Wyandotte Chemicals Corp., J. B. Ford Div., Dept. MF, Wyandotte, Mich.

A new process has been field tested for more than 12 months for precleaning of buffed zinc die castings and other metals, preparatory to plating. It is claimed that the process practically eliminates fire hazards (flash point of the key product is above 210°F.), hand swabbing, obnoxious odors and yet gives improved cleaning.

The new process (Mersoclean-540, Expray-541 and Wyandotte 608) employs bi-layer soak cleaning followed by spray washing for complete removal of all buffing and polishing compounds including those baked on by high temperatures, from all common metals prior to plating — see photo-diagram of a typical operation.

All three of the new products are essentially odor free and non-toxic as they contain no phenols, chlorinated


RACKED WORK
Zinc diecastings, Brass, Copper plate or Steel.
WYANDOTTE BI-LAYER PROCESS
For Buffing Compound Removal
TO TEMPORARY STORAGE - Optional
DRAIN 30 SECONDS
SOLVENT LAYER
AQUEOUS LAYER contains water conditioning additive.
TO PLATING OPERATIONS Electrocleaning, etc.
BI-LAYER SOAK to penetrate and soften buffing compound.
SPRAY CLEANER in spray washer to remove softened buffing compound and solvent.
SPRAY RINSE contains water conditioning additive--prevents staining and corrosion.



SHIELDS
against effects of
TEMPERATURE RANGES
— 000 to + 0000

Electroplated Rhodium protects tools of science from effects due to formidable temperature extremes — as in application of nuclear developments to electronics, instrumentation, laboratory exploration, etc. Used as shielding or as surfacing, it wards off such effects as corrosion, disintegration, malfunctioning, shortened life, transmutation.

The protection of rhodium can be precisely predetermined and accurately implemented because amount of deposition is positively controlled by the Technic method of electroplating.

Technic, Inc., furnishes rhodium electroplating solutions; designs and installs equipment for electroplating rhodium with scientific control. Our engineers stand by until performance is assured. Write for data sheet — "Electroplated Rhodium" — describing properties, thickness requirements, etc.

TECHNIC, INC. 39 Snow St., Providence, R.I.
JAckson 1-4200 Chicago Office: 7001 North Clark St.

THE LARGEST ENTERPRISE OF ITS KIND IN THE WORLD

Churchill Finger Buff*

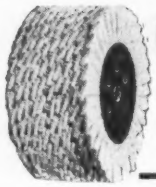
#150 DN *Specifically Developed for Buffing* DIE CASTINGS

#150 DN Ideal for buffing die castings. Exceptionally fast cutting action — no streaking.

Developed specifically for buffing die castings. Each section of this Churchill Type #150 DN is made with a double row of overlapped and staggered fingers. This specialized construction allows great flexibility to working surfaces and thereby gives a smooth and uniform finish to irregular shapes.

In addition, the buff fingers of the adjacent sections meld and fit very compactly together. Thus, the #150 DN absolutely eliminates all streaking and gouging and gives the best finish obtainable on die castings.

If you are buffing die castings we believe these #150 DN Churchill Finger Buffs* merit a trial in your buffing room.



Geo. R. Churchill Co., INC.

CHURCHILL FINGER BUFFS*

*Trade Mark Reg. U. S. Pat. Off.

REPRESENTATIVES IN PRINCIPAL CITIES

FREE Catalog

• Churchill Finger-Buffs* are competitively priced. Produced in all sizes from 4" to 21" diameters. For complete information write us your problem.

Geo. R. Churchill Co., Inc., Hingham, Mass., Dept. MF
Please send me FREE catalog and complete information.

• My special buffing problem is.....

Name..... Title.....

Firm .....

Street .....

City..... Zone..... State.....

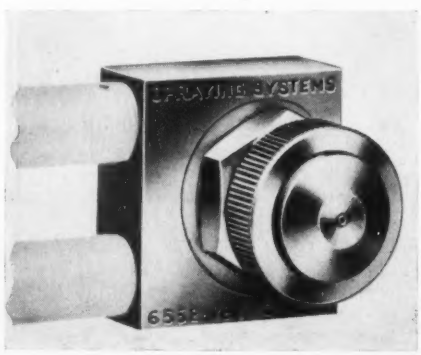
solvents, or similar chemicals. The spray cleaner, Expray-541, will not foam excessively even with high pressure and heavy contamination of buffing compound.

The new precelaning process protects die cast and brass parts against staining during production delays or parts storage before plating. Work that is precleaned needs only brief electrocleaning before the usual acid dips and strike baths before plating.

Pneumatic Atomizing Nozzle

Spraying Systems Co., Dept. MF, 3201 Randolph St., Bellwood, Ill.

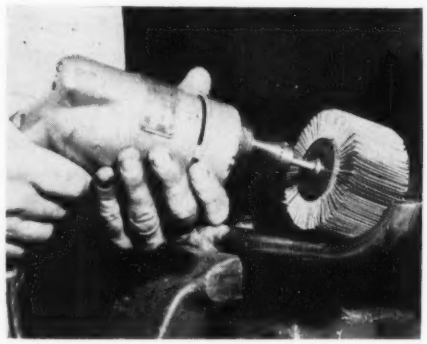
For pneumatic atomizing nozzle applications where space is at a premium, the new 6552-⅛ JAC nozzle offers the important advantage of small size. Overall the body is only 1¼" high x $1\frac{5}{32}$" wide, about equal to the diameter of a half-dollar. The nozzle is equally compact in front-to-back dimensions, the body itself measuring only ½". Depth of the nozzle cap and set-up will depend upon type employed. Since both liquid and air inlets are on the same side, this also helps in compactness of installation.



This new pneumatic atomizing nozzle is supplied in a wide range of capacities in choice of round, wide angle round and flat sprays. Made in brass or stainless steel.

Small Diameter Abrasive Wheel

Merit Products, Inc., Dept. MF, 4023 Irving Place, Culver City, Cal.



Formerly made in 6 inch to 17 inch diameters, and 1 to 3 inch widths, the new model Grind-O-Flex is only 3 inches in diameter, 2 inches in width and in various grits from fine for polishing and buffing, to coarse grits for deburring, smoothing flash and chamfering. The new 3-inch diameter is for sharp bends, contours of small radii and confined areas such as the inside of tubing. Simple to set up, the wheel mounts on any spindle or chuck of present portable or stationary equipment.

Vapor Degreaser

The Dawson Corp., Dept. MF, 302 Fifth Ave., North Pelham, N. Y.

A degreasing machine which utilizes the vapors of trichlorethylene or perchlorethylene is called the '75 Chromplater Vapor Degreaser, and has a degreasing compartment which measures 18" x 10" x 18" deep. It is a companion piece to the '75' Chromplater made by the same manufacturer.

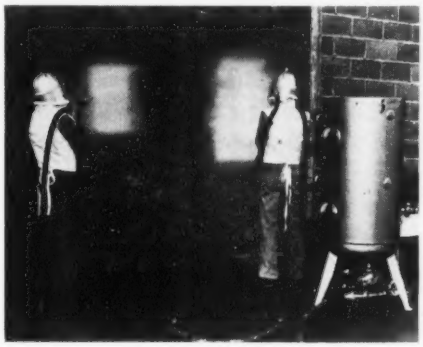
The vapors are generated by thermostatically controlled electric heat which boils the solvent in the degreaser. The machine operates on 110 volt, single phase, 60 cycle current. Two electrical outlets are needed, one for the 1,600 watt heater and the other for a spray pump which provides stream of solution for slush cleaning. The vapors are retained in the degreaser by a cooling coil which condenses the vapors at a

predetermined level. Also, contaminated cleaning solution can be reclaimed by vaporizing and condensing in the storage compartment.

Dual Operator Sandblast Machine

Clementina Ltd., Dept. MF, 2277 Jerrold Ave., San Francisco 24, Cal.

Two sandblasters may now blast from one pot. The latest Clemco Continuous Action Machine, Model CA 2460, is equipped with two blast hoses working off two sand control valves.



These machines are double chamber types holding 1,000 lbs. of sand with automatic pop-up filling valves and 1¼" piping. All blasting is done from the bottom chamber which permits refilling of the upper chamber without interrupting the sandblasting. The abrasive in the upper chamber automatically transfers to the lower chamber. Mounted on three legs and equipped with lifting ears these units are designed for the large scale users. If desired only one hose can be operated.

Glass-Coated Smokestacks

A. O. Smith Corp., Process Equip. Div., Dept. MF, Milwaukee 1, Wis.

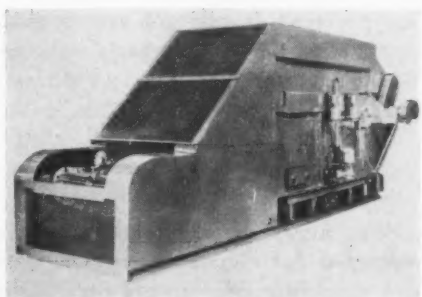
The rapid deterioration of steel smokestacks under conditions of adverse corrosion through acid condensation may be eliminated with the new glass-coated smokestack.

Some advantages of the double glass-coated stack: Corrosion free surfaces, inside and out, give stack years of added life without maintenance; lighter foundation costs—glass-coating at five ounces per square foot compared with conventional inside linings at up to 50 pounds per square foot.

Crossrod Conveyorized Degreaser

Phillips Mfg. Co., Dept. MF. 3473 West Touhy Ave., Chicago 45, Ill.

This new machine is designed to provide for automatic feeding of the degreaser by means of a motorized conveyor belt at the loading end. Another motorized conveyor at the unload end takes the work off as it emerges from the degreaser. Automatic feed is accomplished by means of special hangers which are located properly along the inside cross-rod conveyor system in the machine. These hangers pick up work baskets automatically from the motorized feed conveyor which is activated by limit switches in order to position each basket accurately so that the machine will pick it up.



The new unit is available in either electric, steam or gas heated models. Vapor level is controlled by a water jacket around the tank exterior.

Conveyor speed is approximately 8 feet per minute and capacity of the unit is approximately 3,000 pounds of work per hour. This, however, varies according to the inherent weight of the metal degreased. The degreaser incorporates a complete lubrication system so that it is not necessary to enter the machine to oil the conveyor mechanism.

The machine has an overall height of 8′ 3″. It is 6′ 0″ wide and 15′ 0″ long.

The new unit is designed to handle

TANK HEATING PROBLEMS ELIMINATED!

CLEPCO FUSED QUARTZ IMMERSION HEATERS

Heating your acid tanks with Clepco Electric Immersion Heaters is the most modern and now the most proven of all methods known today.

ASK YOUR LEADING PLATING SUPPLIERS

OVER 100,000 INSTALLATIONS PROVE *CLEPCO* FUSED QUARTZ IMMERSION HEATERS ARE BEST

Clepco Steel and Stainless Immersion Heaters are designed to meet the specific demands of the Alkaline Bath heating problems of the Industry.

WHEN A BETTER HEATER IS MADE, CLEPCO WILL MAKE IT.

clepco

FUSED QUARTZ IMMERSION HEATERS

SEE YOUR PLATING SUPPLY HOUSE
WRITE US FOR LITERATURE

THE CLEVELAND PROCESS COMPANY

1965 EAST 57TH STREET • CLEVELAND 3, OHIO

Check AND Compare

the features of
NEW LUSTER-ON
ALUMINUM SEALER
with the process
you are now using

Luster-on®
ALUMINUM SEALER

- ✓ produces a chromate film on aluminum that provides excellent corrosion protection and serves as an ideal paint base
- ✓ is an excellent substitute for anodizing in many applications where hardness is not a prime factor — gives better corrosion protection than anodizing.
- ✓ is easily applied at room temperature by dipping, spraying or brushing — treatment time extremely short.
- ✓ can be furnished in clear, yellow and dyed color finishes
- ✓ gives maximum salt spray resistance.
- ✓ adheres well, does not leach easily
- ✓ offers extreme economy of use
- ✓ meets government specifications MILC-5541

See for yourself the superior results obtained with new Luster-On Aluminum Sealer.

Send sample for free laboratory treatment.

THE Chemical CORPORATION

58 Waltham Avenue, Springfield, Mass.

high production cleaning of a wide variety of small metal parts, particularly small stampings which are so shaped that they tend to meet together if cleaned in standard type machines.

Copper and Brass Sealer

Conversion Chemical Corp., Dept. MF, Rockville, Conn.

A new chrome sealer, Kenvert No. 32, is especially designed to eliminate "spotting-out" on thin copper and brass plate. The product is also highly recommended for sealing in copper, brass and porous castings without attacking the metal as well as preventing staining and fingerprinting prior to lacquering. It offers excellent adhesion to lacquer films and improves their low properties and coverage. In many instances, the extra lacquer mileage obtained, more than saves the treating cost involved if no other factors are taken into consideration. Extremely simple to use, the material is also recommended for buffed surfaces.

Electrolytic Fused Bath Descaling Process

Hooker Electrochemical Co., Dept. MF, Niagara Falls, N. Y.

Gray iron castings can be electrolytically cleaned more economically than heretofore with Virgo Electrolytic Salt, a new product offered for prompt shipment in commercial quantities. Containing a new and different additive, the salt renders such castings, and related materials, free of sand, scale, graphite, and other surface impurities.

Packed in 400-pound, non-returnable drums, the salt currently sells for $5.50 per cwt in truckload or carload quantities and $6.25 per cwt in less than carload quantities, f.o.b. Niagara Falls, N. Y.

The salt may be readily utilized on a production scale since it is compatible with other known salts and can be added directly to competitive electrolytic baths with no discernible reduction in cleaning efficiency.

The new salt is for use in those cleaning processes involving a molten bath operated in the 900°F. range, followed by a cold water quench and a hot rinse. No acid is required but, while in the bath, the work to be cleaned is subjected to an electrolytic current supplied by a DC generator.

The firm's descaling laboratory is equipped for demonstration on parts not exceeding eight inches in any dimension. The technical sales service department can recommend equipment builders familiar with the type of equipment required.

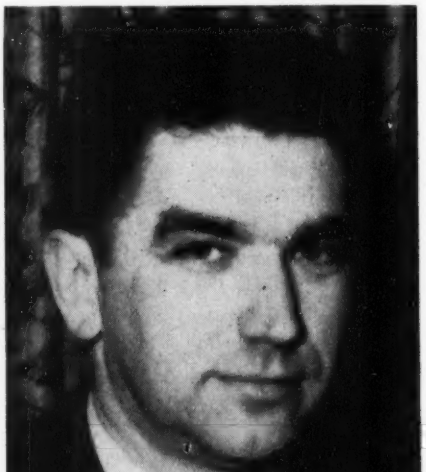
BUSINESS ITEMS

Kelite Appoints Four

Albert W. Lupien, former sales manager of the Midwestern area for *Kelite Products, Inc.*, has been promoted to regional vice-president for the manufacturers of industrial cleaners and cleaning equipment.

Mr. Lupien, who is a member of the National Sales Executives' Club, has been connected with the company in California and Illinois for nearly ten years.

G. Stuart Krentel has been appointed manager of technical sales service for



Albert W. Lupien

G. Stuart Krentel

W. John Boyd

Gurdon T. Henry

the western region. He had been associated with several prominent organizations in the metal finishing field prior to joining the company.

W. John Boyd, formerly sales supervisor of the Chicago area and with the firm since 1946, has been promoted to Metropolitan Chicago district sales manager.

Gurdon T. Henry, a registered professional engineer of California, has been appointed district sales manager in the Ohio area.

New President for Sulphur Products Co.

A Hensel McKeon has been appointed president of the *Sulphur Products Co.*, following the recent death of the firm's founder and president, *Wilfred S. McKeon.*

The new president announced that the firm will continue to serve its customers as in the past, and will do everything within its power to maintain present standards of service.

Allied Research Appoints New Representatives

Allied Research Products, Inc., Baltimore manufacturer of chromate conversion coatings and electroplating chemicals, has announced the appointment of *Jack Gabrielson* as its representative in the Northern Chicago territory. Mr. Gabrielson will serve the area consisting of the North side of Chicago and the Northern Illinois counties including Rockford.

Frank Bryant, formerly covering the Iowa, Nebraska, and West Illinois territory, has also moved to the Chicago area. Mr. Bryant will cover the South side of Chicago as well as Southern Illinois and Indiana.

Arthur Jackson of Davenport, Iowa has been appointed to take over the Iowa-Nebraska-Western Illinois territory, formerly handled by Mr. Bryant.

John Lum, Philip Rech Advanced on Pennsalt Metal Processing Sales Staff

John C. Lum has been named manager of new products, and *Philip Rech* manager of Fosproducts for the *Pennsylvania Salt Mfg. Co.'s* Metal Processing Chemicals Department.

Mr. Lum, a graduate of the Newark College of Engineering, joined the company in 1951 as a product supervisor on the Metal Processing sales staff. He formerly was associated with Westinghouse Electric where his work resulted in a number of patents in the chemical field.

Philip Rech succeeds Mr. Lum as manager of Fosproducts, one of the firm's extensive lines of phosphatizing and lubricating compounds for paint bonding and metal forming.

A graduate of the Peddie School of Heightstown and the University of Pennsylvania, Mr. Rech became associated with Pennsalt in 1951 as a sales development engineer. He formerly was a salesman with the Beemer Engineering Co.

Stauffer Chemical Appoints Behme Eastern Manager of Market Development

Herman Behme has been appointed to the position of eastern manager of the Market Development Dept. of *Stauffer Chemical Co.*

Mr. Behme is a graduate of Rutgers University (1948) and joined the company in 1951 as assistant to the Eastern director of research. He has been in market development since 1952.

The abbot and the Bishop's Candlesticks

The Bishop was upset. How could he possibly have 500 dull, tarnished brass candlesticks polished and gleaming in time for tomorrow's special candlelight services?

The *abbot* was quite calm. He *knew* the answer to the Bishop's dilemma and in less than twenty-four hours, he returned from his laboratory with the candlesticks – bright and glistening.

How did he do it?

Articles made of brass and other metals may be readily burnished and tumbled with Abbott Burnishing Materials. Made in six scientifically designed shapes, Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every conceivable size and shape. Economical to use, they are *deep hardened* and have a mirrorlike glass-hard surface for extra long life. Combined with the Abbott Vertical Tumbling Barrel, they make the perfect barrel finishing combination.

If you have a special barrel finishing problem, let the abbot help you solve it. Just write us.

ABBOTT

The ABBOTT BALL Company
1052 New Britain Avenue
Hartford 10, Conn.

McLeese Elected Metal & Thermit Vice-President

H. D. McLeese

H. D. McLeese has been elected a vice-president of *Metal & Thermit Corp.*, producers of metals, industrial chemicals, plating materials and welding equipment and supplies.

Mr. McLeese, who was named general sales manager in May, 1955, will continue as the company's chief sales executive. As vice-president, he will direct sales, market development and research and advertising. He is also a vice-president of *Metal & Thermit - United Chromium of Canada, Ltd.*

A chemical engineer, Mr. McLeese at one time did research work on chromium plating under Dr. Colin G. Fink at Columbia University. Prior to that he had been connected with Bell Laboratories and Dow Chemical Co. as a chemist.

His experience in plating led to sales positions with the Chemical Treatment Co., and with Chromium Corp. of America and United Chromium, Inc., the latter two affiliates of Metal & Thermit Corp. At United Chromium, now a division of the parent company, he served as sales engineer and sales manager at Detroit before becoming vice-president and general sales manager.

Mr. McLeese was graduated from the University of Michigan with a degree in chemical engineering, and obtained his master's degree at Columbia.

Dr. Smith Appointed by Houghton

Dr. Robert K. Smith has been appointed manager of research for *E. F. Houghton & Co.*, Phila., Pa., manufacturers of industrial oils, packings, metal working products and chemicals.

Dr. Smith, 36, was formerly associated with the Houdry Process Corp., Marcus Hook, Pa., as chief of the exploratory research section. He is a graduate of Pennsylvania State College with bachelor and master degrees in organic chemistry, and received the degree of doctor of philosophy in physical-organic chemistry from Princeton University. Before joining Houdry he was associated with the Kendall Refining Co. and previously with the Standard Oil Development Co. in a research capacity.

Dr. Smith is a member of the executive Committee of the Division of Petroleum Chemistry of the American Chemical Society.

H. P. Barrand Elected Director at H-VW-M

H. P. Barrand

Harry P. Barrand has been elected to the board of directors of *Hanson-Van Winkle-Munning Co.*, according to an announcement from the company.

Mr. Barrand is president and director of the Climax Fire Brick Co., Climax, Pa. He also has his own business at 57 William St. in New York City, where he acts as a financial agent and consultant on problems of financial reorganization.

Mr. Barrand was associated with H-VW-M from 1945 to 1951. He was a vice-president of the company from 1945 to 1947, then served as vice-president and treasurer from April 1947 to April 1950. He was a director from July 1945 to April 1953.

He is a former vice-president (in charge of foreign affairs) at The National Bank of Commerce in New York (now Guaranty Trust Co.). He has also served as a member of the board of directors and executive committee of the French-American Banking Corp., New York, and executive vice-president and member of the board of directors of the Commercial National Bank & Trust Co. of New York (now Bankers Trust Co.).

Herwig Elected Director of Bogue Electric

Robert S. Herwig has been elected a director of *Bogue Electric Mfg. Co.*, Paterson, N. J.

Mr. Herwig is a vice-president of the firm, and is also vice-president and general manager of the company's Belco Industrial Equipment Division which manufactures water purification systems. He has been associated with the division since 1946, serving first as technical sales manager and then as sales manager of the division.

Prior to his association with Bogue, Mr. Herwig was supervisor of metal finishing for Bendix Aviation Corp. and director of chemical research for the Eclipse-Pioneer Division.

Mr. Herwig is a graduate chemical engineer from Newark College of Engineering and is the holder of numerous patents.

Edward J. Kubis Promoted by Wyandotte Chemicals

Edward J. Kubis recently became manager of industrial sales of *Wyandotte Chemicals Corp.*, Industrial, Railroad and Aircraft Department. He will report to *P. N. Burkard*, department manager.

Mr. Kubis is a chemical engineering graduate of University of Detroit.

Edward J. Kubis

Prior to joining Wyandotte in 1948, he served Briggs Mfg. Co. for 5 years, where he became supervisor of process control laboratory.

Following 3 years with Wyandotte's industrial research laboratories, Mr. Kubis became the senior technical service representative for the department which he now joins as manager industrial sales.

Mr. Kubis is Secretary-Treasurer of the Detroit Branch of the A.E.S. and a member of the Surface Preservation Committee of the American Ordnance Ass'n.

Davidson Named Sales Manager of Pennsalt's Metal Processing Chemicals Department

John M. Davidson has been named manager of the *Pennsylvania Salt Mfg. Co.'s* Metal Processing Department. He succeeds *Joseph J. Duffy* who was recently placed in charge of the company's executive development program.

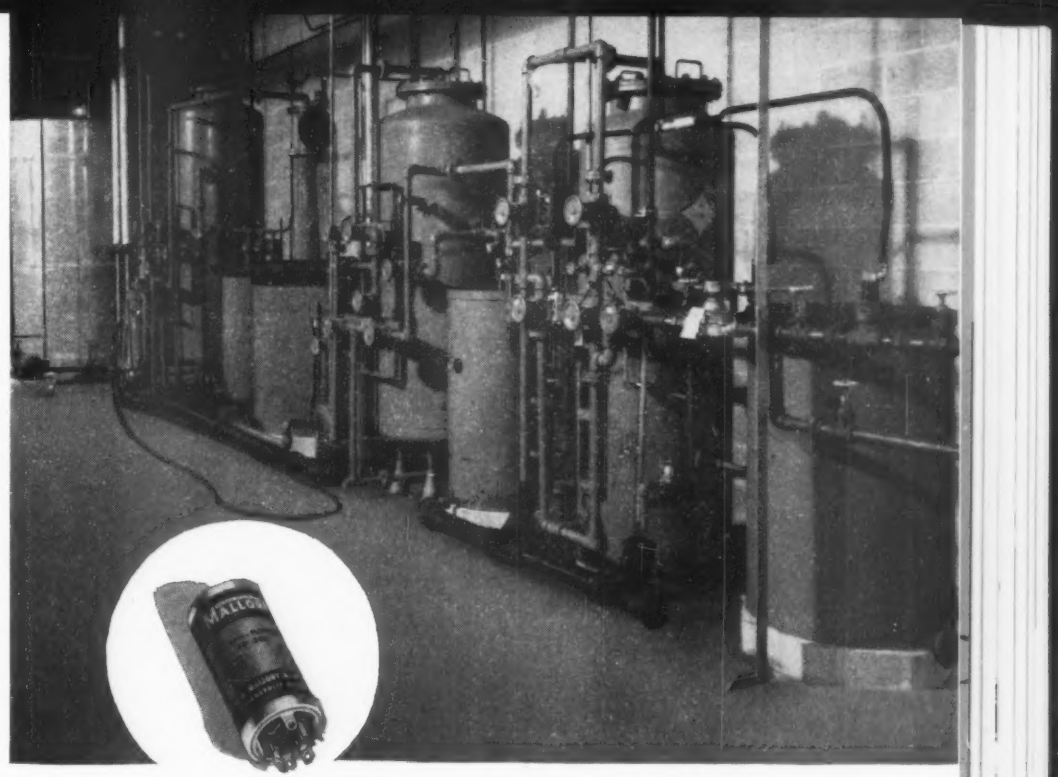
Mr. Davidson would be responsible for the national distribution of the firm's line of phosphatizing, lubricating and cleaning chemicals for the metal processing and basic steel industries.

Mr. Davidson is a graduate of Dickinson College where he majored in chemistry. He joined the company in 1946 following separation from the U. S. Navy, in which service he held the rank of Commander. As a former member of the company's Pittsburgh sales staff, he is widely known in local civic and industrial circles.

Detrex Enters Into Large Expansion Program and Plans Name Change

Hooker Electrochemical Co. is negotiating for the sale to *Detrex Corp.* of its interest in *Hooker-Detrex, Inc.* Detrex, thus, will become the sole owner of the chemical plant at Ashtabula, Ohio, which is the second largest trichlorethylene production unit in the country and a large producer of anhydrous hydrogen chloride. The Tacoma, Wash., plant of Hooker-Detrex will be transferred to Hooker, but it will continue to serve as a chemical supply source for Detrex.

Detrex is now completing near-term expansion plans which will include enlarging its trichlorethylene and hydrogen chloride facilities. Other chemical products are being produced experimentally in its chemical research labo-



How Industrial Demineralizer takes the "die" out of dielectric!

● **Mallory capacitors are processed with pure water for long life at peak performance.**

Water chemistry is important in making Mallory capacitors for radio, TV, military communications and other electronic uses. A necessary component in this wide field, they utilize either fabricated plate or etched foil for anode material.

The process of etching aluminum foil requires the use of caustic salt and acid. The elimination of these chemicals requires final washing with extremely pure water. In addition, the various electrolytes compounded for these capacitors must also **use pure water to maintain the quality** necessary for the exceptional performance identified with Mallory products.

Mallory engineers specified this Industrial demineralizer to provide water of multi-distilled quality for all processing requirements.

This is the sixth Industrial unit bought by Mallory . . . concrete evidence that progressive companies **never take water for granted.** Its ability to carry chemicals can seriously affect product quality. Pure water costs little—an Industrial unit always pays for itself, usually in a few months, by reducing rejects and corrective labor.

Industrial builds complete water treating plants and waste treatment systems, maintaining a large, diversified engineering staff to make thorough process analyses and design exactly the equipment needed. If you use water for any process, write Industrial—a brief outline will bring you recommendations and estimates of costs and savings.

WRITE FOR BULLETIN 200.

Industrial

INDUSTRIAL

FILTER & PUMP MFG. CO.

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ratories which will serve as the basis for further expansion in the near future. Also, new products will soon be added to the drycleaning line being manufactured in the modern plant located at Bowling Green, Ky.

Financing is being provided through a new issue of $1,100,000.00 of preferred stock and a combination bank and insurance company 15 year term-loan in the amount of $3,400,000.00. Detrex is now a closely held corporation but plans to offer securities to the public within the next 12 to 18 months. Upon completion of the acquisition of Hooker-Detrex, all its subsidiary companies will be consolidated to be known as *Detrex Chemical Industries, Inc.*

New Sales Representative Added at Whitfield Chemical

The *Whitfield Chemical Co.*, Detroit manufacturers of industrial cleaning and finishing products, has expanded its sales representation in Ohio and Pennsylvania with the recent appointment of *Thomas J. Henry* as a sales representative in that territory.

Mr. Henry was formerly associated with Socony-Vacuum Oil Co. and Speedi-Dry Corp. He will make his headquarters in Cleveland, Ohio.

Michigan Pipe Named Distributor for Bart Pipe and Fittings

The *Michigan Pipe Co.*, Ferndale, Mich., has been appointed exclusive distributor, in the United States and Canada, for Bart Lectro-Clad, nickel plated pipe and fittings.

Manufacturing will be centralized at a new, specially designed plant in North Newark, N. J. Sales headquarters will be: Bart Lectro-Clad Sales Div., Michigan Pipe Co., 2415 Burdette Ave., Ferndale, Mich.

E. C. Hanus Resumes Osborn Post

Reappointment of *Edward C. Hanus* as personnel manager of the *Osborn Mfg. Co.* was announced recently. Mr. Hanus has just completed an extensive management diversification program designed to give key executives rounded experience in major phases of company operations.

Mr. Hanus, associated with the firm for the past 17 years, left the personnel post in April, 1954, to participate in

E. C. Hanus

the company's executive training. Under this program he served as assistant superintendent of the Brush Division, then shifted on special assignment to the sales department. During his training period, Mr. Hanus also attended both American Management Association's management course and the management development program at Case Institute of Technology.

Spencer Appointed by Armour

Robert S. Spencer has been appoint-

Long or short - -

Plan all your tanks for long life – the STORTS way

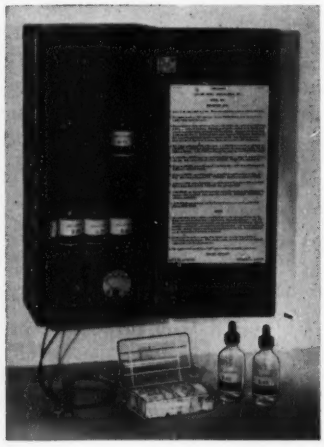
Plan to use a construction material that will check corrosion. Specify Stortswelding, to be sure of sound, strong, dependable welds. Rely upon Storts experienced craftsmen for installation of all details — partitions, coils, fittings, etc.

How long a tank lasts is really what determines the cost. Our aim is to be sure that the material specified is right for the purpose and that fabricating and welding procedures are right to bring out the best performance from the material. Your complete satisfaction is our responsibility. If you have not yet used tanks of Storts quality, let us quote on your next requirement.

STORTS WELDING COMPANY INCORPORATED

38 Stone Street
MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification



THE KOCOUR METAL IDENTIFICATION SET MODEL PIA

Rapid tests for the positive identification of cadmium, tin, silver, lead, nickel, chromium, zinc, absence or presence of chromate conversion films.

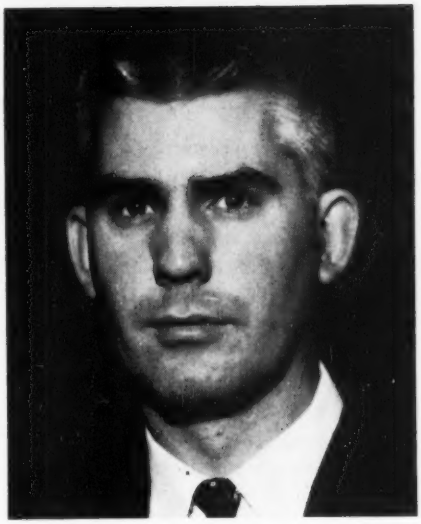
EASY TO USE!

Write for literature!

● KOCOUR testing sets are used all over the world for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.
Write today for complete information — no cost or obligation.

KOCOUR COMPANY
4801 S. ST. LOUIS AVENUE
CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.



Robert S. Spencer

ed district sales supervisor, Coated Abrasives Div., *Armour and Company*, for Ohio.

Mr. Spencer was connected with the Detroit & Pittsburgh Motor Freight, Inc. He atended Kent State University and Alliance public schools, and was in the U. S. Army for 18 months, mostly in the German area.

Van der Horst Held Seminar

The Van der Horst Corp. conducted a seminar on electroplated surface finishes in the corporation's Olean, N. Y. laboratory and plant facilities Tuesday and Wednesday, May 22nd and 23rd.

Electroplated chromium, porous chromium and electrolytic iron and their applications for engineering purposes were reviewed.

Industries represented at the seminar included General Motors, Owens-Corning Fiberglas, New York Central System, General Electric Company, Thompson Products, E. I. DuPont de Nemours, Alco Products, Inc., U. S. Naval Engineering Experiment Station, American Bearing Corp. and the U. S. Navy Bureau of Ships.

Nankervis Moves

George L. Nankervis Co., manufacturers of plating equipment and supplies, and its commercial research division, has moved to 15300 Fullerton Ave., Detroit 27, Mich.

New R/M Sales Appointments

Raybestos - Manhattan, Inc. announces the following appointments:

H. H. Burrows, senior vice-president of Rubber Sales Division. Mr. Burrows joined the Manhattan Rubber Division in 1915, later became manager of the Roll and Tank Department, sales manager of Industrial Rubber Products Division and was appointed a vice-president of the corporation January 19, 1955.

R. B. Hazard, vice-president and sales manager, rubber and packings. Mr. Hazard started in 1945 as a sales representative of the Packing Division at Minneapolis, became manager of distributor sales in the Western District located at Chicago and assumed the sales managership of the Rubber and Packing Divisions January 1, 1955.

S. J. Synnott, assistant sales, manager, rubber products.

C. V. Vetell, manager, rubber product sales.

MacDermid, Inc., Now Has Customer Service Lab.

Manufacturers who clean, plate or finish metal parts of all types now have available a new customer service laboratory at *Mac Dermid, Inc.*, Waterbury, Conn.

Utilizing the latest in metal finishing techniques and materials, the new laboratory enables company engineers to duplicate under rigid control the pro-

the original
McAleer
ESTABLISHED 1923

A complete line of

Polishing and Buffing Compounds

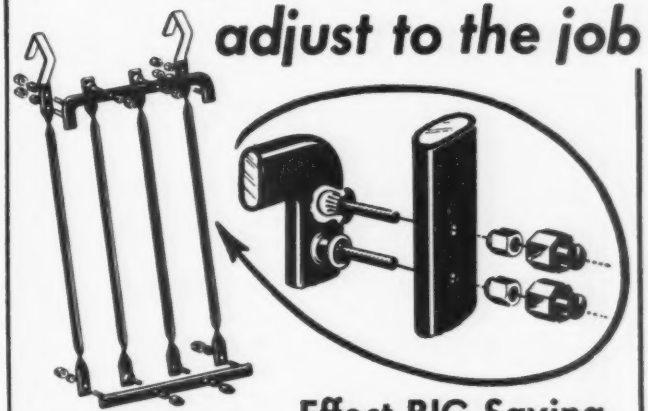
in Bar, Tube, extruded or liquid form.

FREE SAMPLES & PRICES SUPPLIED

Territories available Jobbers and Distributors

McAleer MANUFACTURING CORP.
101 S. WATERMAN DETROIT 17, MICH.

Plating Racks you can adjust to the job



Thinker Boy Racks are assembled from precoated members and tips. BELKE Vac-Seal Assembly seals the joints—only contact tips are exposed to the solution. Racks are easily disassembled without damage to coating.

Available as completely assembled racks or precoated rack members and tips.

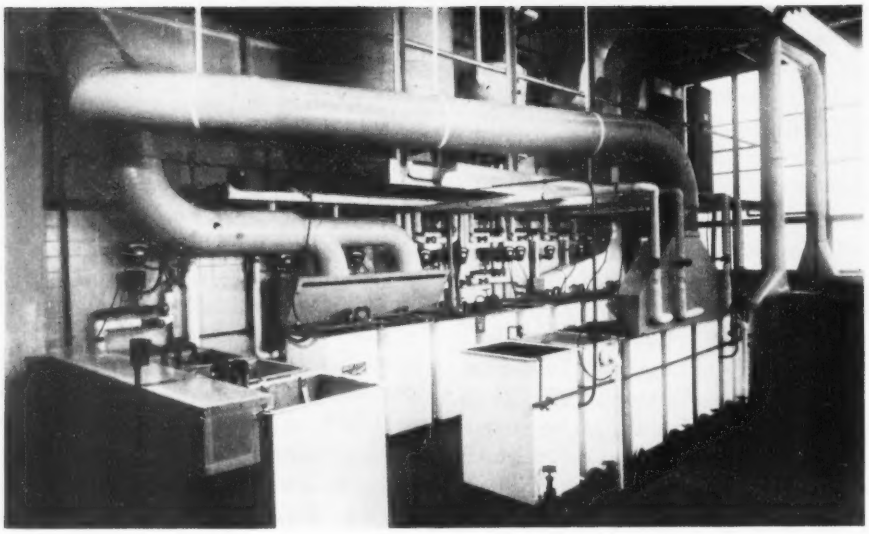
Send for literature.

Effect BIG Saving

When Thinker Boy Racks for a certain job are no longer needed you can respace the members or disassemble and use the parts for other racks.

No added investment. Just order Thinker Boys when you buy racks. Instead of ceilings cluttered with no longer needed racks, you'll soon have a supply of Thinker Boy Parts — be able to assemble coated racks of your own design in a matter of minutes. Ask your BELKE Service Engineer or write for details.

Belke MFG. CO., 947 N. Cicero, Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS



cessing cycle of virtually any metal finishing plant. By taking advantage of these laboratory facilities, manufacturers will be able to analyze and solve metal cleaning, plating and finishing problems before the more costly production stage.

The size of the testing tanks and their flexible arrangement permits Mac Dermid engineers to test a wide variety of parts and finishing chemicals.

New Representative Appointed by Esbec

To serve the growing needs of its customers in the Chicago area, the *Esbec Barrel Finishing Corp.*, Byram, Conn., has just announced the appointment of the *Illinois Deburring Co.*, 3159 W. Madison, Chicago, as Northern Illinois representatives.

The Chicago company is the largest tumbling job shop in the Midwest area. Its owners and partners, *George F. Peterson* and *Henry Latz*, have been well known throughout the area for many years as specialists in all phases of tumbling and barrel finishing operations.

Illinois Deburring Co. is now offering a number of new services to manufacturers, including a free sample-processing service. Unfinished parts may be submitted along with a finished part showing surface desired. The unfinished part will be processed and returned along with quotations and production recommendations. In addition, the Illinois Deburring Co. is offering an in-plant engineering service to assist customers with their production problems, as well as a free training course for customers' personnel.

Stan Barlett Named Head of Washer Division for Circo Equipment Company

The appointment of *Stanford J. Barlett* as manager, Washer Division, has been announced by *Circo Equipment Co.*

Mr. Barlett's responsibilities with

For ALL Your
Metal Finishing Needs
Depend on DAVIES

The Southwest's Leading Supplier of Industrial Plating and Polishing

- COATINGS
- CHEMICALS
- PLATING RACKS
- ABRASIVES
- EQUIPMENT
- ENGINEERING

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301 N. Market St. • PRospect 5423 • Dallas 1
813 W. 17th St. • BAltimore 1-2128 • Kansas City 8

McKeon's
Zinc-Brite
TRADE MARK REG. U.S. PAT. OFF.

Top-quality, low-cost
ZINC SOLUTION PURIFIER

Eliminates heavy metal impurities, including copper.
Prevents harmful build-up of carbonates.

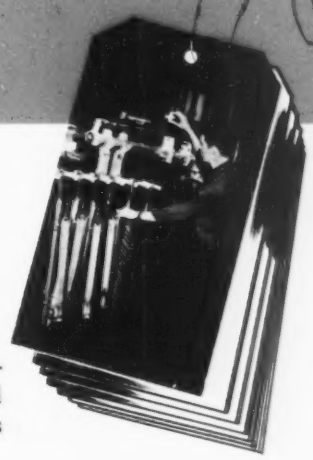
A complete cleansing treatment: — No other purification measures necessary.

WRITE - PHONE - WIRE COLLECT

Sulphur Products Co. Inc.
228 McKeon Way
Greensburg, Pa.

From H-VW-M

10 important ways to keep metal finishing costs down



All the processes, supplies and equipment in H-VW-M's line have been designed for maximum efficiency and cost savings. But among this full line are a group of products and processes which – if they apply to your operations – can offer outstanding costs and labor saving advantages. Included in this group are high-efficiency electrical and processing equipment, unusual processes, and finishing supplies having unique advantages.

The scope of the exceptional H-VW-M products, described on the following pages, covers a wide range of plating and finishing operations of every type, and the likelihood is strong that several, or perhaps all, are applicable to your plating plant. By investigating all of them, you should strike just the process, equipment or supplies you need to effect very real economies in your operations.

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing processes; equipment and supplies

Plants: Matawan, New Jersey • Grand Rapids, Michigan

Sales Offices: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston • Bridgeport • Chicago Cleveland • Dayton • Detroit • Grand Rapids • Los Angeles • Louisville • Matawan Milwaukee • New York • Philadelphia • Pittsburgh • Plainfield (N. J.) • Rochester • St. Louis San Francisco • Springfield (Mass.) • Utica • Wallingford (Conn.)

10 important ways to keep

ELECTRICAL AND PROCESSING EQUIPMENT

New Germanium Rectifier with panel removed to show simplified construction.

Manual Tap Switch Control

Motor Operated Tap Switch Control

Continuously Variable Auto-Transformer

Saturable Core Reactor

Operator is shown adjusting the Dial-A-Cycle mechanism that will determine the cycle for this rack of work.

Automatic loader-unloader has just removed two racks of plated bumper guards and loaded two more of work to be plated.

GERMANIUM RECTIFIERS

Although only recently added to the H-VW-M family of electrical equipment, H-VW-M Germanium Rectifiers are already widely used in plating, anodizing and related processing, where they are known for their efficiency, economy of operation, compactness, and close voltage control. Available in 6 to 80 volt capacity models with current outputs of from 500 to 10,000 amperes (or, in combination, unlimited output), these dependable, easy-to-maintain rectifiers available in either self-contained or remote controlled models, are designed for 24-hour-a-day operation at full capacity.

At full load, with voltage outputs of 12 volts and above, H-VW-M Germanium Rectifiers have efficiencies in excess of 90%. At ¼ and ½ loads, efficiencies are exceptional. Voltage regulation of as low as 5% can be obtained from no load to full load at voltage ratings of 20 volts and above.

Features include an integral cooling unit and overload and line short circuit safeguards. New low prices on many H-VW-M Germanium models mean you can enjoy the benefits of this type, in some cases, for the same price you would pay for a comparable Selenium Rectifier.

RECTIFIER CONTROLS

H-VW-M offers a complete line of rectifier controls to provide for many control functions. Used with either selenium or germanium rectifiers, these controls, properly applied, permit the most efficient control possible. Such devices as manual and motor operated tap switch controls, continuously variable auto-transformers and saturable core reactors are used with or without supplemental controls to provide automatic voltage stabilization, automatic current stabilization as well as automatic programming. H-VW-M Bulletins ER-108 and ER-109 further explain economical H-VW-M Rectifiers and Controls. Write for it.

FULL AUTOMATIC CONVEYORS

For well over 30 years H-VW-M design engineers have worked continuously for improvements in the automatic conveyors for electroplating and allied operations in which H-VW-M pioneered.

Today's full-automatic conveyors are a far cry from the conveyors produced by H-VW-M as early as 1922. But one thing remains the same – and that is H-VW-M's desire to provide the most advanced and efficient equipment possible. Scores of innovations and improvements resulting from continuing H-VW-M research mean today's H-VW-M Full Automatic Conveyors offer the ultimate in service and efficiency for peak production of the highest quality at lowest cost.

DIAL-A-CYCLE CONTROL

Exemplifying the many H-VW-M developments contributing better, easier plating, is the remarkable new DIAL-A-CYCLE Control. This unique selective by-pass mechanism – of particular interest to aluminum anodizers – permits a whole series of different operations and cycles in one full automatic conveyor. Length of any treatment time can be varied, and, in anodizing, different colors can be anodized in one continuous operation, and in any sequence. It is a truly revolutionary device, resulting in remarkable labor savings and increased production.

AUTOMATIC LOAD-UNLOAD

Automatic Load and Unload is another recent development of H-VW-M that contributes to greater economies in the plating room. This new transfer unit, operating the same indexing sequence between plating conveyor and a monorail conveyor loads and unloads racks automatically. Manual handling is eliminated by this major advance towards automation in metal finishing.

This, of course, is just one of many types of conveying equipment offered to metal finishers. Return type conveyors, elevator conveyors, high-lift conveyors, straight line conveyors, and others – of every description are H-VW-M designed, manufactured and installed. If you'd like to know more about the cost-saving story of H-VW-M Full Automatic Conveyors, write for Bulletin FA-105.

metal finishing costs down

BUFFING AND CLEANING SUPPLIES

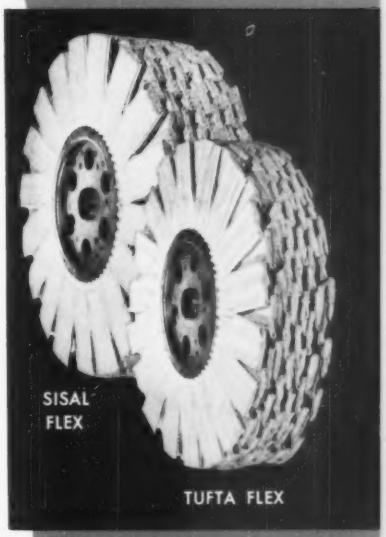
BUFFS

Tufta-Flex and Sisal-Flex Buffs

Speed and economy are embodied in two new H-VW-M Buffs for thorough cutting and coloring on contoured surfaces. For medium and heavy duty, SISAL-FLEX Buffs with sisal-cored tufts are available, and for light to medium duty, TUFTA-FLEX Buffs, having full cloth tufts, are offered.

Both buffs feature double-folded tufts for maximum cutting surface, and to retain compound on the leading edges and ends of the tufts. To prevent streaking, tufts are staggered in a double row around the buff. Cool running, a feature of both buffs, is the result of staggered tufts, plus a pattern of ventilating holes in the rugged steel center. Fraying, which is wasteful and expensive, is ruled out by the bias-cut construction of both cloth and sisal.

These time and cost-saving new buffs are available in standard diameters from 12 to 18 inches.



BINDERIZED® RUFF-L-BUFFS

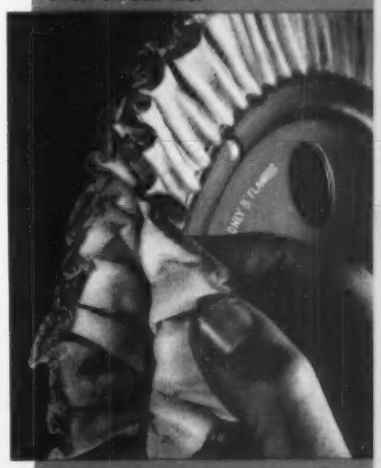
"BINDERIZED" Ruff-L-Buffs are pre-treated with a high quality compound binder. Because every fibre is impregnated with the same binder used in buffing compounds, Binderized Ruff-L-Buffs are ready for operation at top efficiency from the very first piece.

The cost-saving advantages of Binderized Ruff-L-Buffs are many. "Heading-up" is eliminated, thus break-in time is radically reduced. Because of the natural affinity between the Binderized Ruff-L-Buffs and the compound, the compound lasts far longer, and is easier to apply. Naturally, much better cut is obtained because of the high amount of compound carried.

Perhaps the greatest advantage of Binderized Ruff-L-Buffs is their internal lubrication which prevents wear inside the buff (see photos). Wear is even—and up to 30% longer. To learn more about the unusual economies of Binderized Ruff-L-Buffs, write for Bulletin No. B-103.

Plain Ruff-L-Buff (below) after wearing off ¾ inch in test. Loose threads, numerous holes and breaks due to excessive heat and abrasion are apparent.

Binderized Ruff-L-Buff (below) after same test. Notice absence of thread or cloth breakage, convincing proof of Binderizing's effect on buff life.



LIQUIMATIC COMPOUNDS

and application equipment

Buffs "live" up to 200% longer . . . No compound waste . . . Reduced labor costs . . . Fast cutting, easy cleaning—all these advantages and more are embodied in the unusual Liquimatic Liquid Compounds and application equipment.

Because of the enormous economies of using the Liquimatic System, the system soon pays for itself in buff, compound and labor savings.

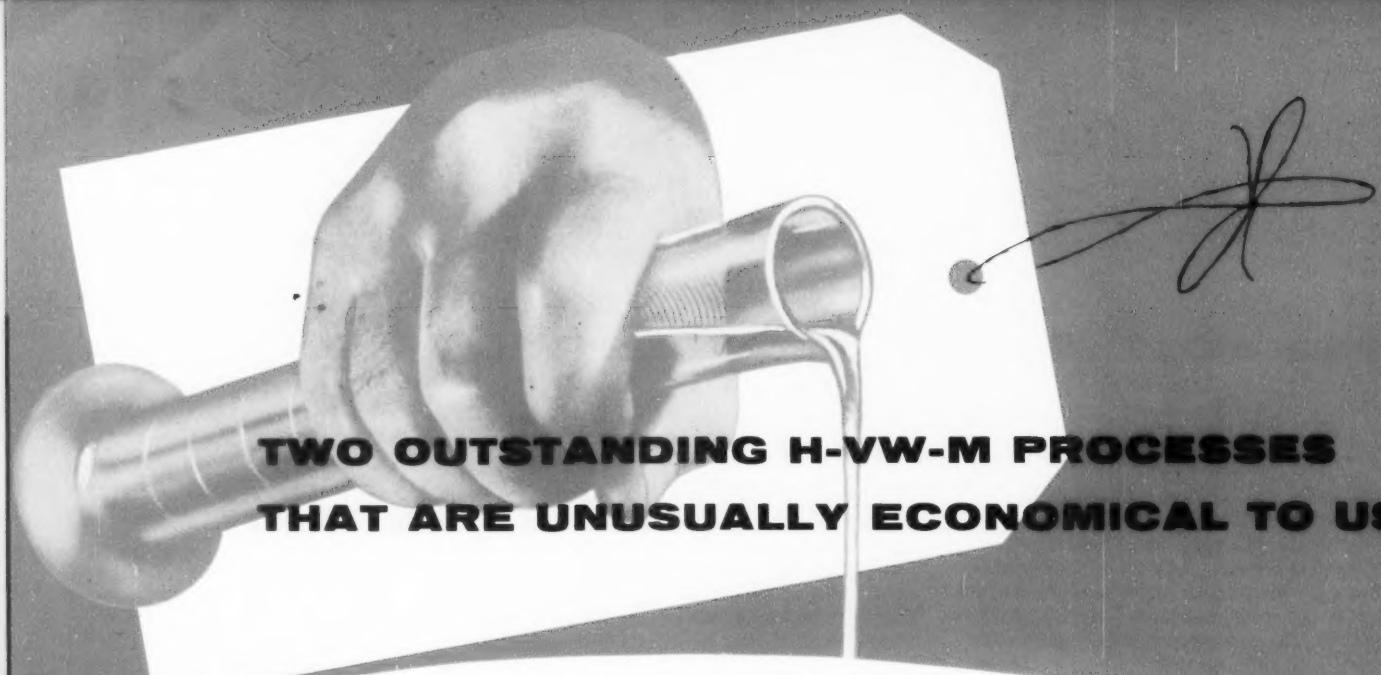
A complete line of Liquimatic Compounds is available for cutting and coloring ferrous and non-ferrous metals. These provide an adhesive, slow-wearing buff face, and have a high safety factor because of their high flash point. All are of sprayable viscosity, and have a long storage life. Write for H-VW-M Bulletin No. Co-103, which fully describes Liquimatic and other economical H-VW-M Compounds.

85-S ALUMINUM CLEANER

H-VW-M devotes constant research to the subject of cleaners and the result is a comprehensive line of Matawan Cleaners giving superior results in soak cleaning, power spray operations, oxide removal, and special cleaning and etching operations.

Of particular importance is H-VW-M's new 85-S Aluminum Cleaner, which offers interesting advantages to aluminum finishers. It prevents scale formation, for instance, thus keeping coil and tank walls scale free, and it leaves an extremely bright surface. Its built-in regenerator makes maximum effective use of caustic in the bath.

H-VW-M Bulletin C-108 tells about this unusual cleaner, and other Matawan Cleaners offering unusual money-saving advantages.



TWO OUTSTANDING H-VW-M PROCESSES THAT ARE UNUSUALLY ECONOMICAL TO USE

LEVELUME

H-VW-M's new **LEVELUME** represents a milestone in nickel plating processes. It is the first bright nickel process to combine qualities of full brightness, high leveling and exceptional speed. In high-production installations, deposition rates with **LEVELUME** are 100% higher than those obtained with any other process, but will require some air agitation equipment.

Conversion to Levelume is simple, involving no new investment in conveyors, or tanks.

Key to the new process are its addition agents. With them an activated carbon pack can be used in the plating solution filter. This constantly removes harmful organic contamiments, preserving the purity of the bath, and consequently contributing to the economy of the process.

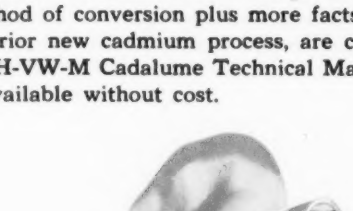
A few of the additional benefits include high surface activity, good ductility, controlled stress, and the feasibility of double coatings. A full description of the process—one in the family of NICKELUME processes—is available in the Levelume Manual, which is available on request.

CADALUME

Bright, uniform attractive cadmium deposits are obtained with Cadalume—a new, clear, low-cost bath which makes bright dips unnecessary. With the process, ferrous parts are protected against corrosion and non-ferrous parts against surface tarnish, corrosion or galvanic couples formed in assemblies.

Like bath cost, the rate of consumption with Cadalume is low, since a single liquid brightener is used in a standard cadmium solution. Other advantages include increased plating speeds, improved deposit distribution and throwing power, and heavy deposits, where required, without surface defects or loss of brilliance.

Conversion to Cadalume is simple and low cost. Method of conversion plus more facts about this superior new cadmium process, are contained in the H-VW-M Cadalume Technical Manual, which is available without cost.



H-VW-M PROCESSES, SUPPLIES AND EQUIPMENT KEEP PLATING ROOM COSTS DOWN . . .

They're Always Your Best Buy!

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing processes, equipment and supplies

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Sales Offices: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston • Bridgeport • Chicago Cleveland • Dayton • Detroit • Grand Rapids • Los Angeles • Louisville • Matawan Milwaukee • New York • Philadelphia • Pittsburgh • Plainfield (N. J.) • Rochester • St. Louis San Francisco • Springfield (Mass.) • Utica • Wallingford (Conn.)

3627

Printed in U. S. A.

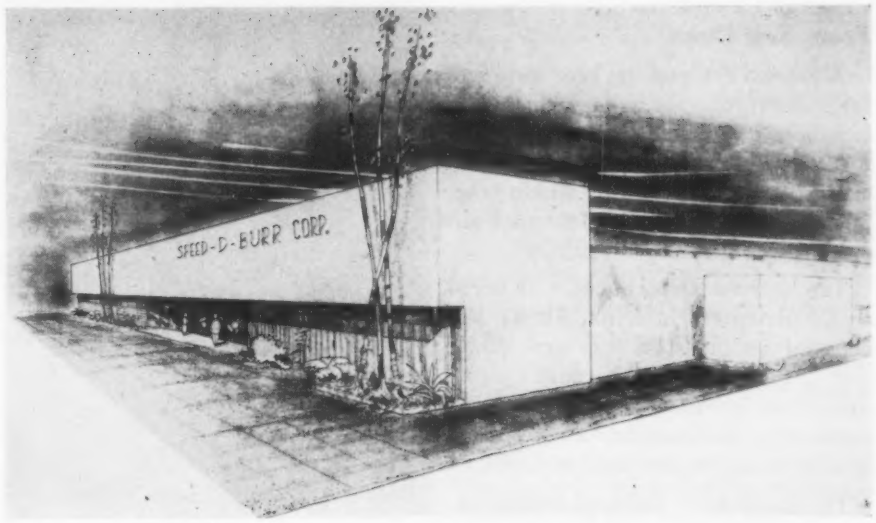
the Rahway, N. J., firm will include complete supervision in sales, design and manufacturing metal parts washers and dryers or complete finishing systems.

Following service in the Production Branch of the USAF's Air Materiel Command, with the rank of Lieutenant Colonel, Mr. Barlett has had ten years' intensive experience in all phases of metal finishing, anodizing and paint finishing techniques. Both his military and civilian activities provide insight into procurement and engineering sales-service with the emphasis on metal parts washer systems.

Mr. Barlett, a resident of Riverdale, N. Y., is a science graduate of Ohio State University and a member of the American Society of Mechanical Engineers.

New Factory for Speed-D-Burr Corp.

Ground has been acquired and construction work will begin soon on a completely new, modern design factory for the *Speed-D-Burr Corp.*, Glendale, Calif. The new plant, costing more than $250,000.00, will be located near



Lomita, and South Main in Los Angeles and will more than triple present manufacturing facilities. Planned for the new plant will be the world's finest and most modern barrel finishing laboratories for experimental, customer service and planned research into barrel finishing problems. In addition to being air conditioned throughout, other conveniences for employees and visitors such as snack bar, etc., are part of the new plant planning. More than 3½ acres of ground have been acquired for the new factory to allow for ample trucking and parking facilities as well as expected future expansion.

The present plant in Glendale will continue to operate at full capacity for service to industry in the northern and western areas. Here, customer experimental and processing work, job work and media and compound storage will be further expanded to give even more complete service to companies in those areas.

BEAM-KNODEL CO.

Metropolitan Distributors

HANSON-VAN WINKLE-MUNNING CO.

Complete Service for Metal Finishing

Products Listed Below Available in New York Stock With Reasonable Exceptions

GENERATORS

Anodes, All Kinds	Tallow	Nickel Salts
Brushes	Rouge	Copper Salts
Buffs	Emery Paste	Cyanide
Chemicals	Cleaners	Tanks, All Kinds
Tripoli Comp.	Emery	Plating Barrels
Acme White Finish	Glue	Polishing Wheels
		Polishing Lathes

195 LAFAYETTE ST., COR. BROOME

Phone CAnal 6-3956-7 NEW YORK 12, N. Y.

FILTERS

MAIZO Drying Materials

LEA Buffing & Polishing PRODUCTS

"We are all through with pipe coils. They are too costly and they are out of date. No more pipe coils for us."

Now they use the

DEAN THERMO-PANEL COIL®

because it is so superior for the heating or cooling of solutions for metal washing, degreasing, plating, bonderizing, etc. Not only does the Dean Thermo-Panel Coil occupy much less space; it weighs considerably less; it is more easily installed, removed, and cleaned and therefore costs less for maintenance; it is more efficient; and is more readily adaptable to heating and cooling problems. Obviously, the Dean Thermo-Panel Coil is much more economical than pipe coils.

Bulletin 355 — 52 pages — tells all about it. Bulletin 256 tells how you can do your own figuring, selecting, estimating, and designing. Which bulletin shall we send? Both? And, without obligation, our engineers will gladly help you if you wish.

Backed by 20 years of panel coil manufacturing.

DEAN THERMO-PANEL COIL DIVISION

DEAN PRODUCTS, INC. 613 Franklin Ave., BROOKLYN 38, N. Y

Tel. STerling 9-5400

General Electric to Erect New Plant

A general contract has been awarded for construction of a new plant in Lynchburg, Va. to house the *General Electric Co.'s* Rectifier Department. Construction will begin within the next two weeks, with completion scheduled for early spring of 1957.

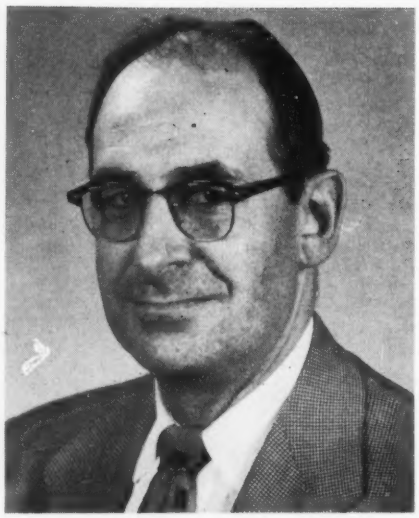
The Rectifier Department, with present headquarters in Lynn, Mass., announced its plans for the new plant last September. Long range plans showed the need for relocating the department to accommodate the needs of other growing departments in Lynn.

The Lynchburg plant, providing in excess of 250,000 square feet of office, manufacturing and laboratory space, will eventually employ about 1,000 persons. It will occupy a 100 acre site two miles beyond the Lynchburg city line.

Rigdon Joins Stevens

Charles G. Rigdon has been appointed to the newly created post as barrel finishing engineer for *Frederic B. Stevens, Inc.*, Detroit 16, Mich.

Prior to joining Stevens, Rigdon



Charles G. Rigdon

was employed four years as Detroit branch manager for *Almco Div., Queen Stove Works, Inc.*, and six years with *McAleer Mfg. Co.* of Detroit.

During World War II he worked with the Detroit office of U. S. Army Air Force Procurement.

Rigdon's responsibilities will extend over the entire United States in the capacity of assisting the firm's regular sales engineers with barrel finishing problems.

Pfizer Announces Five Assignments in Chemical Sales Division

The Chemical Sales Division of *Chas. Pfizer & Co., Inc.*, announced five personnel changes in its Brooklyn headquarters organization and field sales forces, effective June 1.

Willard K. Thayer was named field sales manager of the eastern region. A graduate of Northwestern University, Mr. Thayer joined the company in 1948 as a chemical sales representative. He was appointed administrative assistant to the manager of the Division's Medicinal Chemical Department in 1953 and held that post prior to his present assignment.

Robert C. Denman was appointed manager of the Industrial Department. He joined the firm as a sales representative in the Detroit area in 1949 following graduation from McGill University with a degree in chemistry. Transferred to the Brooklyn headquarters staff in 1953, Mr. Denman later served as assistant manager of the Food and Beverage Department and joined the Industrial Department staff last year.

John R. Post, formerly sales repre-

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Used Cold. Non-flammable.

Non-injurious.

For speedy removal of tough industrial paints, enamels, synthetics, lacquers, varnishes, wrinkles, dye markings, graphite, metal lithography, epoxies, and enamel wire stripping.

- Apply by DIP — SPRAY — or BRUSH.
- WATER FLUSH — or RAG WIPE.
- REFINISH.

PHOENIX COLD STRIPPER

★ Will not affect precision parts of ferrous and non-ferrous metals, wood or glass.

★ Non-corrosive, Non-evaporating, Non-toxic.

★ Does not lose strength through usage. Just add new stripper to replace drag-out.

Salvage Expensive Rejects At Low Cost!

Write for SAMPLES and QUOTATIONS, or ORDER 5 GALLON AT DRUM PRICE.

PHOENIX ABRASIVE & CHEMICAL CO.
Dept. M
657 BERRIMAN ST., Brooklyn 8, N. Y. • Nightingale 9-2771

★ BUFFING NU SPRA GLU
Liquid buffing compound since 1945

★ NUGLU
Cold flexible glue since 1937

★ BRUSHING NUGLU
Grain and Nuglu mixture since 1941

★ SPRAY BUFFING EQUIPMENT
Guns, pumps, and valves since 1945

J. J. Siefen CO.
5643 LAUDERDALE · DETROIT 9, MICH.

sentative in Southern California, was assigned to the headquarters staff of the Medicinal Chemical Department in Brooklyn. Mr. Post has served with the company since 1949, when he completed pre-medical studies at the University of California with a BA degree, majoring in zoology.

Robert W. Johnson, who joined the company in 1953 as a chemical sales representative, has been assigned to serve in the Oakland, Calif. area, as well as Northern California, Southern Idaho, Utah and Western Colorado.

Robert J. McGrath, a graduate of Kansas State College and a member of the chemical sales force since 1953, will serve as a representative in the Los Angeles and Southern California area.

Waalkes Named Assistant Manager of Compound Sales at H-VW-M

Paul A. Waalkes has been named assistant manager of compound sales for *Hanson-Van Winkle-Munning Co.*

In this capacity he will direct the company's program for formulating and developing metal finishing compounds at the company's J. C. Miller Division, Grand Rapids, Mich.

Paul A. Waalkes

Mr. Waalkes joined the J. C. Miller Co. in 1947 in the research and development department. He was made supervisor of the buffing compounds department in February, 1955, and held this position until his present appointment.

Prior to this Mr. Waalkes worked in the analytical department of Dow Chemical Co. from 1941 to 1942. During World War II he was a pilot in the U. S. Army Air Force, holding the rank of captain. He served overseas in Australia and New Guinea.

Mr. Waalkes is a graduate of the University of Michigan, receiving his BS degree in chemistry in 1947. He is a member of the Grand Rapids branch of the American Electroplaters' Society, and at present is second vice-president of that organization.

Magnus Announces International Conference

Magnus Chemical Co., Inc., Garwood, N. J., manufacturers of cleaning compounds announces that they will hold an International Sales Conference, the first of its kind in this country, to discuss new and improved methods of cleaning. The conference will begin on Monday, May 28th, at the Winfield Scott Hotel, Elizabeth, New Jersey, and end on Friday, June 1st.

Among the many representatives who will attend will be: *Soto,* Sociedad Espanola Ulzurrun, Madrid, Spain; *Holger Hansen,* Magnus Chemical Co.

Fulton Asphalt Co.
BUILDERS BUILDING • 165 W. WACKER DRIVE
CHICAGO 1, ILLINOIS

Ferrolite® Hot Mastic Floors
- in colors
- acid proof
- oil and grease proof
- load sustaining
- over 500 lbs. psi.

Industrial Floors
Asphalt Mastic Floors
Acid Proof Mastic Floors

Serving Industry Since 1870
Write for literature

FILTER with a Sethco
New, Exclusive Self-Priming
FILTER PUMP
300 GALS. PER HOUR

SERVICE — Filters any acid or alkaline plating solution from ph 0 to ph 14. Removes particles down to 1 micron.

DESIGN: Filter Assembly as illustrated in H.T. Lucite (also available in Stainless Steel 316, Haveg, Epoxy Resin, Rigid Vinyl, Saran, Polyethylene, Teflon). Filter tubes of cotton, dynel, porous stone or porous carbon. PUMP: Self-priming, Stainless Steel 316 (also available in an all plastic construction). Available as Centrifugal in Stainless Steel or Hasteloy. Motor is ¼ H.P., totally enclosed Ball Bearing. HOSE: acid and alkaline resistant. Base Platform: linen-impregnated phenolic laminate on rubber tire, ball bearing casters.

Model LSIN-20 portable, 65 lbs. 14" x 18" x 24" high

25 Stock Models to fit your needs. 50 to 2,400 gal./hr. cap. Others to your specifications.

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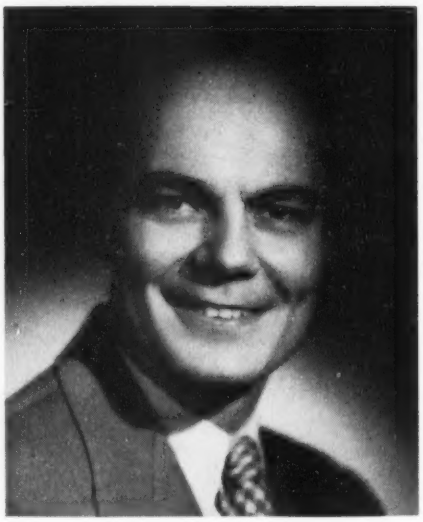
Norsk A/S. Oslo, Norway; *Nagai* and *Satomi*, Parker Commercial Co., Ltd., Tokyo, Japan; *Dr. Jorge Torok*, Fabrica Produtos Lavex Para Industrials Lavanderias, Ltda., Rio DeJaneiro, Brazil; *Marcel Boss*, Societe Mabor, Seine, Et Oise, France; *Greville Hicks*, Magnus Chemical Co., Richmond, Victoria, Australia; *Paul Pichet*, *Paul Charbonneau*, *Clem Leamen* and *Jacques Clement*, Magnus Chemical, Ltd., Montreal, Quebec, Canada; *Clem Ching*, Hawaii Chemical Co., Honolulu, Hawaii; *Don Lerch*, Magnus Chemical Co., De Venezuela C. A., Caracas, Venezuela; *Luis Miranda* and *Julio Molina Font*, Casa Molina Font, Mexico, D. F.; *Raimundo Martinez De Castro*, Raimundo De Castro, Havana, Cuba.

Goodsell Forms New Corporation

R. B. Goodsell, vice-president of *Racine Plating Co.*, one of the leading plating companies in Racine, Wis., has formed a new corporation to engage in high vacuum metalizing. The corporation is known as *Vacuum-It, Inc.*, and is located at 622 Stannard St., in Racine. The new company will plate ferrous, non-ferrous, and plastic parts either with first or second surface coatings as required.



R. B. Goodsell

General Ultrasonics Moves to Larger Quarters

The General Ultrasonics Co. of Hartford, Conn., manufacturers of ultrasonic processing equipment for use in cleaning, degreasing, pickling and electroplating announces move to new and enlarged plant at 67 Mulberry St., Hartford 3, Conn. The new air-conditioned plant provides the additional production, test, research and development facilities required by this company's rapidly expanding business.

Schori Expands Facilities

Expansion of facilities to meet the increased demand for their Iolyte laminated fiberglass products, is announced by Schori Process Division of *Ferro-Co Corp.*, 6-11 43rd Road, Long Island City 1, N. Y. A new building is being erected adjoining their present plant at 59-31 54th Street, Maspeth, L. I. This will bring the area available for production to 60,000 sq. ft., almost doubling their present space.

Middle Atlantic Company to Represent Pennsalt Chemicals in New York

The *Middle Atlantic Co.*, 216-07 Hillside Ave., Queens Village 27, N. Y., headed by *John H. Herz*, will represent the *Pennsylvania Salt Mfg. Co.'s* Metal Processing Department in the New York Metropolitan, Westchester and Long Island areas.

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News from California

By Fred A. Herr

Downing Morgan reports that he has completed the installation of equipment in his recently established firm—A & A Metal Finishing Co.—and has begun operations in production metal polishing and buffing in a shop at 8414 South Central Ave., Los Angeles.

The plant has no plating facilities but is equipped only for buffing and polishing. Major equipment consists of three new 10 h.p. polishing lathes. Morgan had no previous experience in the finishing business. He was formerly connected with Harbor Boat Building Co. at San Pedro, Calif., a designer and manufacturer of mine sweepers for the Navy. He has engaged *Del Overton*, an experienced polishing man, as plant foreman.

Max Golden, plating superintendent for Trophycraft, Inc., 249 North Reno St., Los Angeles, has returned from a 4½ months stay in Puerto Rico where he supervised the installation of a trophy manufacturing and finishing plant for Trophycraft. He reports that casting, polishing, plating, lacquering and assembly facilities were installed. Max stayed down there long enough to supervise the installation of equipment as well as to train a shop crew. *George DeHart* has been named foreman of the Puerto Rico operations. Golden has resumed his post as shop foreman of Trophycraft's Los Angeles plant.

Sunset Plating Co. has completed a $10,000, 25 x 25 foot addition to its plating plant at 432 North Varney St., Burbank, Calif. which, according to owner *Henry Saklad*, has been equipped for magnetic plating of aluminum and other type recording drums. Saklad reported that he has concluded arrangements with George W. Slomin & Associates of Los Angeles under which Sunset Plating becomes the only job shop in the Los Angeles area which is an exclusive licensee for Nico plating, a cobalt nickel alloy electroplate used for plating recording drums. The new department has been equipped with special rotating machines for applying the drum plate, in addition to which the firm's precious metal plating department has been expanded to include facilities for rhodium and bright gold plating.

Phillip Greathead has announced that he has acquired sole ownership of Square Deal Machine Co., 8695 Otis St., South Gate, Calif., from his partners, *Myron Haggen* and *Roger Dunagen*. Since its establishment in 1945, the firm has been engaged in the design and manufacture of polishing and buffing equipment, and now specializes in polishing lathes and automatic polishing machines.

The change in the setup involved an interchange of interests under which Greathead took over the interests of Haggen and Dunavan in Square Deal Machine Co., and the latter two acquired ownership of the J. O. Line Tool Co. of South Gate which, heretofore, was owned equally by the three men.

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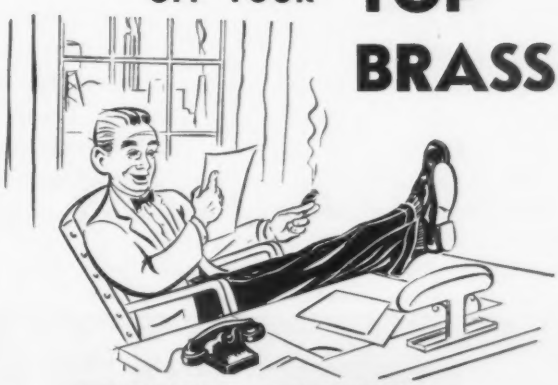

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TRUE BRITE CHEMICAL PRODUCTS CO.

BOX 31, OAKVILLE, CONN.

George W. Slomin & Associates, Los Angeles, have announced a three semester course in electrochemical technology designed to provide platers, chemists and engineers with technical knowledge regarding special electrochemical processes.

Unit No. 1, 2nd semester, 1956, will include electroplating, anodizing, electroforming, and electropolishing. Unit No. 2, 1st semester, 1957, has been planned to incorporate plating on aluminum, magnesium and titanium; plating on non-conductors — plastics, glass, ceramics; plating on printed (etched) circuitry; and precious metal plating—gold, rhodium, platinum and palladium.

The topics for Unit No. 3, 2nd semester, 1957, have been announced as plating of magnetic alloys — cobalt, nickel, iron; plating on germanium and silicon, for semi-conductor applications; rare metals plating—indium, ruthenium, Rhenium; and special plating techniques . . . P. R. plating, superimposed A.C., and statistical methods.

The courses will be held on the Slomin premises at 309 West Pico Blvd., Los Angeles. Lecture sessions are scheduled Tuesday and Thursday evenings from 7 to 9:30 p.m., with laboratory sessions, involving student conducted experiments, on Saturdays from 8 a.m. to 4 p.m. The courses were scheduled to start about mid-July. Instructors are *George W. Slomin, David Schneiderman* and *Wesley Stupar.*

Major additions to the hot strip, plate and tin mills and the existing electrolytic tin plating installation will be included in a $113 million dollar expansion program at the Kaiser Steel Corp.'s operations in Fontana, Calif.

Construction was to begin in July with the first steel production scheduled for September, 1957. The new plant facilities will increase steel and tin plate production from 1,084,400 tons to 1,528,000 tons per year. The added 440,000 tons, according to the announcement, will take the forms of tin plate, plate steel, hot chilled steel and structural steel. (See Nov., 1954, METAL FINISHING for illustrated article on existing electrolytic tinning facilities, at Kaiser's Fontana plant).

Speed-D-Burr Corp., Glendale, Calif., has appointed the Industrial Materials Co. of San Francisco as distributor of its barrel finishing equipment in the San Francisco Bay area and other parts of Central and Northern California. The company is a well-known distributor of abrasive, chemical, sanding and grinding material. The firm has made Speed-D-Burr equipment available for personal inspection and operation of Bay Area plating shop owners. For this purpose a complete processing department for test and experimental work, pilot runs, customer process development, and job shop barrel finishing has been established in Oakland. This department will be operated, it was announced, as a subsidiary firm under the name of Micro-matic Deburring Co. at 1447 34th Street, Oakland.

William T. Elmas, who was formerly attached to Speed-D-Burr's main office in Glendale, has been named supervisor of the department in Oakland.

Palmer Mfg. Corp. of Phoenix, Ariz., recently installed a new electrostatic paint booth for finishing evaporative air coolers. The electrostatic booth replaced the former hand spray-gun operation with which the coolers were given their final finish, and requires one operator in place of the former ten spray-gun men.

The electrostatic paint booth supplements a washer and phosphatizer, flow-coat primer spray booth, and gas-heated infra-red ovens. The set-up for bonding paint to metal has been streamlined with maximum use of overhead as well as bed-type conveyors. The finish applied in the plant is either a hammer tone or high-gloss enamel, depending upon the type of finish desired.

The Norton Co. of Worcester, Mass., has announced the appointment of *Robert N. Hamilton* and *Robert P. Cooper* as abrasive engineers in the Los Angeles, Calif., territory. Both formerly served in the Los Angeles district office as field engineers. Hamilton, with the firm since 1948, switched from control engineering work to sales work in 1950. He was assigned to the West Coast office in 1953. Cooper joined the organization as a trainee in 1952 and has served as a Los Angeles field engineer since September, 1953.

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Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Saginaw Valley Branch

On May 9, 1956, the last meeting of the 1955-1956 season of the Saginaw Valley Branch was held in the Colonial Room at Zehnder's Hotel in Frankenmuth, Mich.

After a very fine chicken dinner, and a short business meeting, the principal speaker, *John Delos* of the Ternstedt Division of General Motors, was introduced.

Mr. Delos gave a very interesting and informative talk on waste disposal at the Ternstedt Flint plant. The talk dealt with the problems encountered and methods used to cope with plating wastes from one of the largest plating installations in the world.

After the talk on waste disposal, *A. J. Medwedeff* showed slides of a tour he had taken through western United States. These were enjoyed by all.

Charles Melekian
Recording Secretary

Newark Branch

Following the usual Dutch Treat Dinner at the Robert Treat at 6:30 and movies by *Howard Cobb*, the May 18th meeting was called to order by President *C. Struyk*.

Sec. *Don Foulke* reported considerable written information had been received re the resignation of the executive secretary. He noted that, according to the By-Laws of the AES, this matter is definitely a problem of the Executive Board. Nonetheless it was agreed by the officers and delegates in informal meeting that all members should be informed — so all correspondence was laid open for perusal after the meeting. It was also noted that *George Wagner* was a member of the investigating committee appointed by President Kelly and, therefore, Newark Branch could be assured that the best interests of the Supreme Society and Newark Branch would be served.

A communication from the Robert Treat guaranteed the reservation for the annual Educational Session, December 14th(and the Christmas Party Dec. 15th, 1956.

Dr. Foulke read a request from the Technical Societies Council of New Jersey, Inc. asking for suggested topics for their annual meeting and asked that anyone with suggestions contact him, *Cliff Struyk* or *Dodd Carr* by June 15th.

A communication from the National Office requesting assignment of proxy was discussed and, since Newark was certain that at least three delegates would be on hand, it was moved and passed that no proxy would be assigned and that the delegates should attend the Convention uninstructed. Four applications were accepted and the fol-

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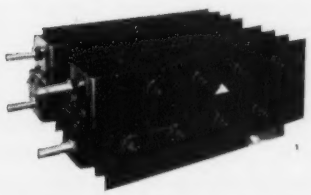
Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



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Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts D.C. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

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lowing elected to membership: *David Bauman*, Metal Finish, Inc.; *Wm. Du Fosse*, American Electroplating Co.; *Eugene Gut*, B & G Corp.; *James Langen*, H-VW-M Co.; *Albert Ronzo*, Quality Plating Co.

George Reuter reported progress in writing up the Newark Branch history and Treasurer Wagner's financial report for the year was accepted, after which President Struyk instructed the board of managers to audit the books as soon as convenient.

John Banta introduced a resolution commending Dodd Carr and *Gus Bittrich* for their splendid job done in organizing and carrying through to completion the two semesters of the Newark Branch electroplating course. The resolution was unanimously passed.

Dodd Carr then introduced George Reuter of J. Wiss and Sons who discussed the manufacture and finishing of shears and scissors (under 6 inches). Samples were passed around and, at the conclusion of this interesting talk, all had a better understanding of manufacture and finishing of these items as well as better judgment as to how to choose good shears.

Dr. E. J. Serfass, Lehigh University, then discussed "Vacuum Metalizing" both from a theoretical and a practical viewpoint in his usual capable manner to the members present. Slides and a number of examples of specialty work done by the Serfass Corp. added to the interest of the subject.

D. Gardner Foulke

Detroit Branch

Howard McAleer, president of Formax Mfg. Co., the new Detroit Branch president succeeding *Lee Morse*, Chrysler Corp., opened the last Spring meeting at 8:30 P.M. in the Michigan Room of the Statler Hotel with approximately 120 members and guests present.

Manuel Ben, General Motors Corp. Technical Center, the new first vice-president was elected by the executive committee to replace *Bob Racine*, who is transferring from the local branch to take up a new position as district sales manager with Clevite Corp. in California. He was formerly with Wyandotte Chemicals as sales manager. The Detroit chapter paid particular credit to Bob on the outstanding job he had done during his tenure in office. Manuel Ben has been very active in A.E.S. work, both in the local chapter and in the formation of the Saginaw Valley Branch.

Seven new members were voted into the chapter which brings the Detroit Branch to a total of 681 members.

Doug Thomas, educational chairman, was introduced and then turned the program over to the technical chairman of the evening. *C. D. Sparling*, president of C. D. Sparling Electroplating Co. Mr. Sparling introduced the first speaker of the evening on the Symposium of Waste Treatment.

David Kahn, City of Detroit Engineers Office, and *Lyle Reading*, Detroit Department of Building and Safety, spoke on "Detroit Waste Regulations." Specifications can be obtained from the city and they mentioned that wastes should be treated before they reach the sewage disposal plants. A minimum of pH 5 and maximum pH 10 will be accepted with no more than 5-6 p.p.m. of cyanide.

R. W. Parker, engineer, Michigan Water Resources Commission, spoke on "Michigan State Waste Regulations." He mentioned that each disposal problem stands on its own and that home rule takes precedent. All new plants that have plating wastes for disposal must file statement of what disposals they will have with the Water Resources Commission. If not, penalties are severe. In the Detroit area, *Gerald Calhoun*, Trenton Disposal Plant, can be contacted on disposal problems.

Dr. Louis Weisburg, consultant, New York City, spoke next on "Recovery vs. Disposal." A few important facts he mentioned were that alkalis and acids can be handled separately from any CN or Cr wastes. CN wastes can be handled most effectively by evaporative rinse waters and this also may be applied to chromic acid wastes with the aid of ion exchange.

President McAleer then paid particular tribute to *Anthony Partensky*, Douglass-Lomison Co., who was elected to Member Emeritus. Mr. Partensky has been a member of the Detroit chapter since 1915, and he gave the chapter a brief picture of the plating trade in his younger years.

The meeting was adjourned at 10:45 P.M. to informal gatherings and the serving of refreshments.

Patrick J. Driscoll

Pittsburgh Branch

The final meeting of the branch was held in the Gateway Plaza restaurant of Pittsburgh's Golden Triangle. Dinner was attended by twenty seven members.

Following dinner, the business meeting was opened by President *R. Schindler*. The first item of business was the accepting of two new applications for membership. These were for *Richard P. Cope, Jr.* and *Joseph E. Kessler*. Six new members were also welcomed by the branch. They were: *A. J. Chinnici, C. R. Harr, A. J. Jantsch, W. S. McCormick, A. S. Mickelson*, and *S. M. Robertson*.

Myron Ceresa reported to the group on last month's Ladies Night Banquet which was a huge success with 278

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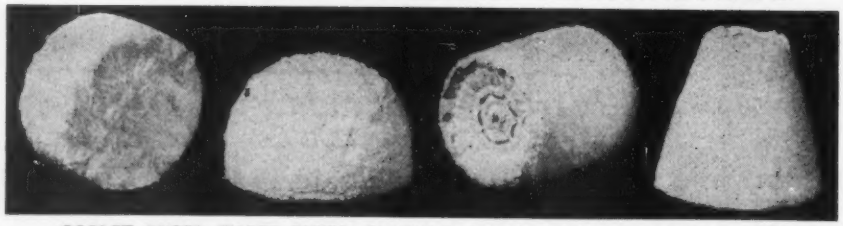

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attending. The committee which was responsible for the fine evening was commended by the branch. The committee consisted of *K. Hittle, M. Ceresa,* and *J. Kristofik.*

The death of *Wilfred S. McKeon,* after a lingering illness, was made known. Wilfred was a charter and honorary member of the branch and was always very active in branch activities. He will be sorrily missed by everyone.

The installation of officers was conducted by one of our distinguished past presidents, *Leo Schmitt, Sr.* before *J. Crain,* retiring librarian introduced the evening's speaker.

The speaker was *Claude C. Weekly* of Promat Div., of Poor and Co. The topic of Mr. Weekly's talk was: "Present Practices and Probable Trends in Zinc Plating." Some interesting facts of early plating procedures as well as some developments in future zinc plating were brought out in the talk by the speaker.

After a short stretch, names were drawn for free dinners and the monthly door prize. *R. Shindler* was the only winner of a dinner as the others drawn were not present at this dinner. The door prize was won by *D. Porter.* The prize, a set of plastic dishes, was presented by *Russ Reynolds* of the Udylite Corp. The usual question and answer period followed and concluded the meeting.

Fred Stevens
Secretary

Buffalo Branch

The May Buffalo Branch meeting was held Friday the 4, at the Markeen hotel. Two new members were admitted to the Buffalo Branch. *Hyman Chessin,* Olean, N. Y.; *Kenneth Mau,* Buffalo, N. Y. Three applications for membership were read and referred to the board of managers, *Louis Stark,* Grand Island, N. Y.; *Robert Bair,* Niagara Falls, N. Y.; *Arthur Bryant,* North Tonawanda, N. Y.

A tenative report on the finances of the Regional meeting was given by *Chas. Fotheringham.*

Picnic date is July 21, 1956 at Edgewater Park Hotel, Grand Island, N. Y., from 1:00 P.M. to Midnight.

Afternoon Program: Golf. Boating on a 31 foot cruiser. Play area for children, Baseball game—Buffalo vs. Rochester, Refreshments all afternoon.

Evening Program: Buffet supper (Smorgasbord), music and dancing.

Tickets are $5.00 each. Children under 16 years free.

S. A. Fabry of Belke Mfg. Co. spoke on the subject "Design and Construction of Plating Racks."

Eric O. Sampson, Jr.
Secretary

The Ultrasonic Manufacturers Association

The Ultrasonic Manufacturers Association announces the formation of its engineering Standards Committee. Composed of members from 17 leading ultrasonic manufacturers in the United States, this committee has been established to formulate engineering standards and practices for this new and rapidly growing industry.

N.A.C.E.

Technical meetings have been scheduled by three of the regional divisions of the National Association of Corrosion Engineers this fall. All sessions contemplate meetings of technical committees and presentation of formal technical papers. Meeting dates and programs planned are as follows:

October 15-17. Northeast Region, Drake Hotel, Philadelphia. Symposia on protective coatings, metals and alloys, cermets and plastics and the use of statistical methods will be held. Technical committee meetings will be held on Monday, October 15.

October 23-26. South Central Region, Gunter Hotel, San Antonio, Texas. Symposia are planned on utilities industry, high temperatures, transportation industry, cathodic protection, pipe lines and oil and gas well equipment.

November 15-16. North Central Region, Hotel Statler, Detroit, Michigan. Symposia are scheduled to cover the automotive industry, construction industry, chemical industry and utilities and power industry.

Manufacturers' Literature

Cathode Rod Agitator

Randall Manufacturing Co., Inc., Dept. MF, 801 Edgewater Rd., New York 59, N. Y.

The above firm has issued a leaflet on its cathode rod agitator for electroplating, which includes specifications, installation instructions and a parts list.

Further information may be obtained by writing directly to the above manufacturer.

Germanium and Selenium Rectifier Guide

Bart-Messing Corp., Dept. MF, 125 Manchester Place, Newark, N. J.

A new revised edition of their popular "guide" to power conversion rectifiers, has been published by the above

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- NON FLAKING, NON DUSTING
- QUICKLY SOLUBLE . . . UNIFORM SIZE
- EASY TO IDENTIFY — LOOK LIKE MARSHMALLOWS

KRAFT CHEMICAL COMPANY
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manufacturers of Sel-Rex rectifiers.

The new 12-page guide is profusely illustrated with photographs of different sizes and styles of rectifiers for every D. C. power need, annotated with detailed information to aid in the selection of rectification equipment for specific applications. Featuring the new germanium rectifiers, the guide also illustrates a self-contained selenium unit.

Moisture Proofing Concrete

Pennsylvania Industrial Chemical Corp., Dept. MF, Clairton, Pa.

Losorb, a new additive for moisture-proofing concrete and cement materials, is described in a new bulletin page, recently published. The bulletin page, which is free, gives the characteristics and applications and tells of the advantages of using the product in industry.

Hydromatic Valve

Cochrane Corp., Dept. MF, 17th St. below Allegheny, Philadelphia 32, Pa

Publication 5813 describes the Hydromatic valve used in the control of demineralizers, zeolite softeners, dealkalizers and pressure filters, to eliminate the complicated nest of individual valves required for the control of the various stages of service, backwash, regeneration, rinse, and return to service. The publication describes the design features, operation and advantages.

Bulletin on Filtration

Graver Water Conditioning Co., Dept. MF, 216 West 14th St., New ork 11, N. Y.

Bulletin WC-107A, Water Filters, Pressure Type, completely describes the uses, design features and engineering details of pressure sand and gravel filters.

Details of all accessory equipment, the different types of controls available and a detailed table giving capacities, sizes and space requirements are included. Cutaway views of both horizontal and vertical filters are shown as well as details of strainers, distributor systems and piping arrangements.

Metallic Shot and Grit

The Cleveland Metal Abrasive Co., Dept. MF, 800 East 67th St., Cleveland, O.

Designated as Catalog No. 556, this new sales literature discusses the company's laboratory facilities, presents technical data, and illustrates the various types of shot and grit produced by the company in their 20th Century Line.

SAE specifications are included, as well as a discussion of the various types of cleaning and peening methods.

Finishes for Threaded Parts

The Allen Mfg. Co., Dept. MF, 133 Sheldon St., Hartford 2, Conn.

A new 12-page reference booklet, G20, on "Metal Finishing Standards" covers the subject of plating and surface treatment of the firm's products very thoroughly.

The first section of the booklet is devoted to general facts on metal finishing, with a discussion of purposes for various types of finish, thread fits, formulas for calculating thread sizes before plating, quality requirements, hydrogen embrittlement, and protective handling and packaging methods. The second section, arranged in easy-reference table form, covers various types of plating, with a clear statement of advantages and limitations, applications, specifications, and appearance of each type. The third section is a similar table for various types of surface treatment. A corrosion resistance table follows, an outline of test methods, a section on stainless steel, and a listing of specification symbols complete the booklet.

Exhaust Fans

Propellair Division, Robbins & Myers, Inc., Dept. MF, Springfield, O.

A new line of industrial fans designed to handle corrosive fumes, high temperatures and humidity, abrasive dusts and dirt-laden air is featured in a bulletin compiled by the above manufacturer.

The six-page, two-color bulletin describes the applications for the belt-driven tubeaxial fans and the requirements for use under special conditions such as high temperatures, corrosive exhaust and outdoor installation.

Photographs, cross-section drawings and charts illustrate features of the fans, which are aavilable in two types —for applications at normal or high temperatures.

Flowmeters

Fischer & Porter Co., Dept. MF, 692 Jacksonville Rd., Hatboro, Pa.

A 16-page catalog, 10-A-25, describes the above manufacturer's new glass tube variable-area Flowrator meters.

The catalog describes in detail the models available, various types of tubes and floats, predictable performance characteristics, construction features, and accessory equipment. A section devoted to extensions and secondary instruments, which can be used with the 1700 series meters, is also included.

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Compressed Air Problems

Van Products Co., Dept. MF, Erie, Pa.

Air, Water and Industry, (Some compressed air problems and how to solve them) is a 20-page story of why there is moisture in air lines, how it got there and it's destructive action, described with animation. Pocket size, it requires but 7 minutes reading time and expertly describes moisture problems and what can be done about them.

As a companion piece, the brochure, "Moisture Control by Vi-Speed" has been completely revised in describing an improved method for removing moisture from air, hydrogen, nitrogen and natural gas lines. It includes new model specifications, dewpoint chart, approximate air needs of tools and also describes the new Type 'B' Dryolite desiccant which provides greater efficiency with a wider temperature range, assuring instrument quality clean, dry air at low cost.

Canned Motor Pumps

Chempump Corp., Dept. MF. Station M, 1300 East Mermaid Lane, Philadelphia 18, Pa.

Just published, four-page bulletin 1050 details features and specifications of the company's line of canned motor pumps for general process pumping. Included are performance curves, dimensions, principles of construction and operation, cut-away views, materials available, power requirements and other descriptive material.

Glass Pipe and Fittings

Fischer & Porter Co., Dept. MF, 683 Jacksonville Road, Hatboro, Pa.

A new catalog 80-10 describes the above company's line of glass pipe and fittings. Fabricated from Pyrex brand glass tubing, these pipe and fittings are primarily designed for laboratory or pilot plant use and other special services. Sizes from ¼-inch to 1-inch, internal diameter, are kept in stock for immediate shipment.

In addition, the catalog describes new threaded metal couplings for metal-to-glass and glass-to-glass connections plus high pressure glass stopcocks which are offered in spigot type, two-way and three-way designs.

Dust Collectors

Torit Mfg. Co., Dept. MF. 287 Walnut St., St. Paul 2, Minn.

The firm's complete line of cabinet cloth filter and cyclone separator type dust collectors is pictured and described in a new 16-page catalog.

Included in the literature are reasons why dust collectors are essential to industry, how unitized collectors save money and how they can be used. Also included is a list of operating and construction features, details of each model, accessories, optional equipment, selection information, specifications and descriptions of such allied products as exhausters and blowers made by the firm.

Photographs in the catalog show many actual installation views as well as products. Line drawings are used to illustrate specifications, and cutaway drawings show operational procedures.

Copper Anodes

The American Metal Co., Ltd., Dept. MF, 61 Broadway, New York 6, N. Y.

Latest data on oxygen-free high-conductivity (OFHC) copper anodes are now available in two free brochures issued by the above company. Publication CA-11 is a report by an independent industrial research laboratory on the results obtained with OFHC anodes in various acid and cyanide plating baths. The report covers experiments in which the new anodes were matched against other types of copper anodes under different operating conditions. Detailed descriptions of the operating conditions and of the results obtained are presented, along with extensive tables and graphs.

Publication CA-10, "Improving Your Electroplating Operation," highlights the data given in the laboratory report and describes the resultant electroplating advantages in a less technical, fast-reading style.

Demineralization

Graver Water Conditioning Co., Dept. MF, 216 W. 14th St., New York 11, N. Y.

Technical Reprint T-140, a 24-page, profusely illustrated article on all the phases of demineralizing, discusses in detail the advantages and disadvantages of this process for today's power plants.

The paper considers some of the developments, trends and applications of both multi-bed and mixed-bed ion exchange and uses several case histories as examples. A complete comparison of the two types of demineralizing systems is presented as well as some of the important factors that go into the chemical and mechanical design and operation of these units.

In addition to a bibliography containing 119 separate items, the paper, which was originally presented at the Diamond Jubilee Annual Meeting of the ASME, has several valuable tables on such items as characteristics of anion exchangers, materials of construction, glossary of terms and spe-

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cific conductivity of effluent. Flow sheets, descriptive drawings, performance curves, process selection charts and cutaway views are also included as part of this highly informative, impartial paper.

NEW BOOK

Surface Treatment and Finishing of Aluminium and Its Alloys

By S. Wernick and R. Pinner. Published by Robert Draper, Ltd., 85 Udney Park Road, Teddington, Middx, England. 1956. Price: $12.00, postpaid. 534 pages plus appendix and index.

Covering, as it does, every phase of finishing aluminum, even including organic finishing, vitreous enamelling and metal spraying, this book may be considered one of the most valuable compilations available to the metal finisher. To this reviewer, it appears that practically everything previously disclosed on the subject has been included, both the theoretical aspects and the practical applications. Well fortified with references at the end of each chapter, the authors discuss not only the well known chemical treatments for aluminum but the mechanical surface treatments as well. One might almost say that, if a process was ever reported or suggested, it is described here.

The quite recent development of chemical polishing processes, or bright dips, for the white metal, together with the improvements in electropolishing, anodizing and coloring, brought forth within the past few years, have emphasized the need for a book of this kind, which can provide a ready source of information on formulas and operating conditions. The inclusion of 104 tables and 189 figures will prove indispensable to research workers and practical finishers who seek reference to all the important theoretical work, or to the corrosion characteristics of the various alloys and their finishes.

METAL FINISHING has published, during the past two years, a condensed version of the material which the authors prepared for the book, from which readers will recognize the wealth of information accumulated by Messrs. Wernick and Pinner. No other source in the English language can even remotely compare with it in scope.

For finishers presently concerned with aluminum, this volume is a must, beyond question. For others, this book will be a most valuable addition to the reference library for future need, since there should be no fear of the mass of data becoming outdated.

OBITUARY

ROBERT W. BUZZARD

Robert W. Buzzard, a project leader in the Metallurgy Division of the National Bureau of Standards, died suddenly of a heart attack while attending a conference of the Atomic Energy Commission at Ames, Iowa, on May 3rd.

For many years Mr. Buzzard worked on the development of anodic coatings for the protection of aluminum and magnesium alloys against corrosion. He holds several patents in this field. For the past several years he has supervised a group of metallurgists engaged in the development of constitution diagrams of alloy systems of metals particularly important to the Atomic Energy Commission.

During World War II, Mr. Buzzard, then a major in the Ordnance Reserve, was ordered to active duty in 1942. He served in the African and European theaters and was awarded the Bronze Star Medal as well as two service medals. He was promoted to lieutenant colonel, returning to the National Bureau of Standards as a civilian after the conclusion of hostilities.

Prior to his employment at the Bureau in 1927 he was employed at the Navy Department.

Mr. Buzzard was born in Fenton, Mich. on April 15, 1904 and received Bachelor of Science degrees in Chemical Engineering in 1926 and Metallurgical Engineering in 1933, both from Michigan State College in Lansing, Michigan.

Mr. Buzzard was the author of numerous technical and scientific papers. He belonged to the American Society for Metals, American Institute of Mining and Metallurgical Engineers, Army Ordnance Association, and Alpha Chi Sigma. He was a registered professional engineer in the District of Columbia.

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SITUATION WANTED—16 years experience in copper, nickel, chrome, gold, brass, bronze, bright silver, tin and zinc. Hold a BS degree in chemistry and have done graduate work in metallurgy. Address: July 10, care Metal Finishing, 381 Broadway, Westwood, N. J.

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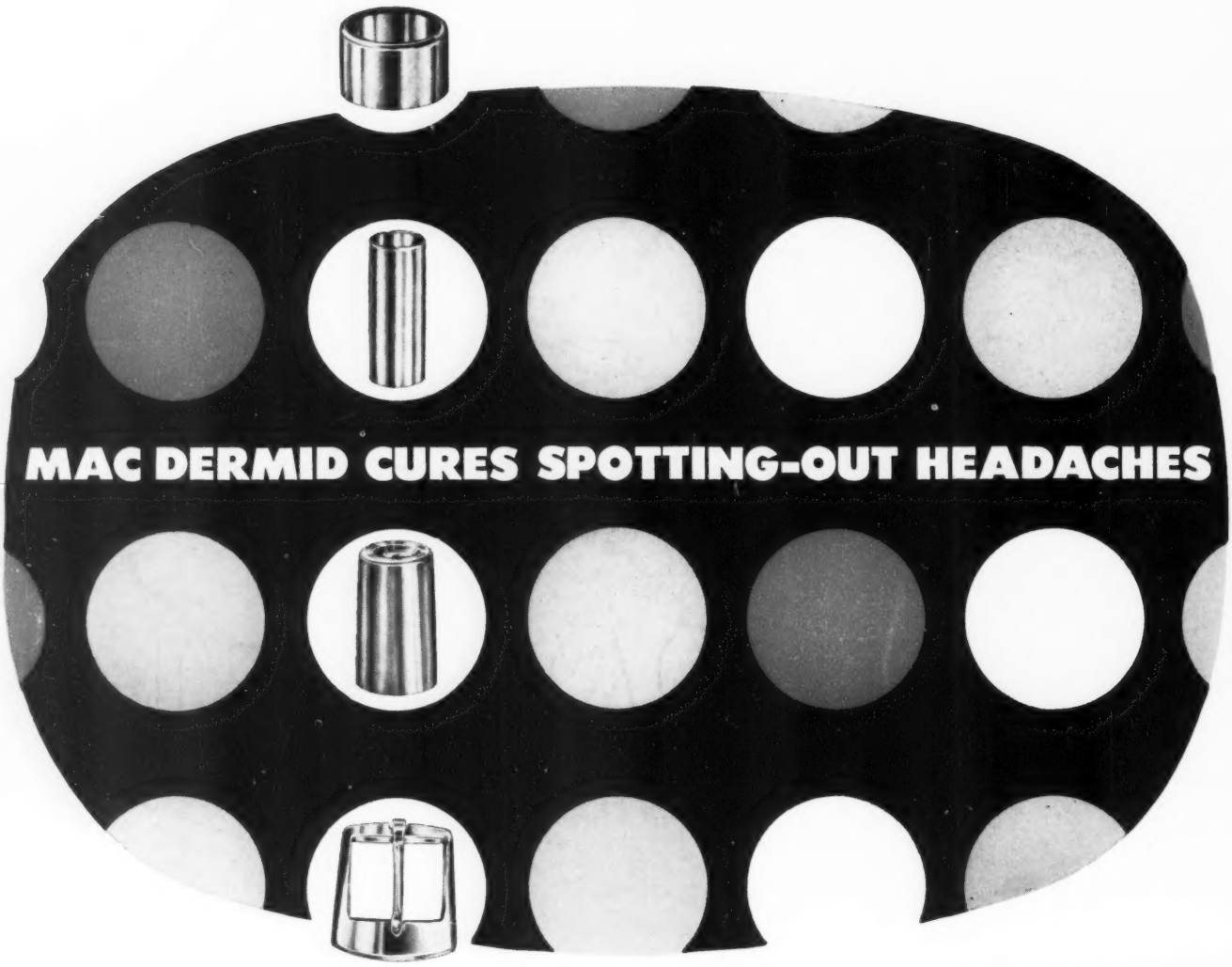

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